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THE DEVELOPMENT OF WATER POWER.

The meeting of the National Conservation Congress at Washington last week developed its usual animated discussion regarding water powers, with the usual wide difference of opinion between those favoring the two extremes of policy by the Federal Government regarding developments which it can control; namely, those upon navigable streams and those requiring the use of public lands for either power house or transmission purposes. The one faction advocates the extreme of government restrictions in such developments, while the other advocates no regulation whatever by the Federal Government and would leave whatever regulation may be necessary to the separate states within whose borders the development may take place.

Happily the majority of the members of the Committee on Water Power took neither of these extreme views but in its report formulated a constructive and practical program of progress for the development of the available water powers, pointing out that true conservation demands as wide utilization of this natural resource as may be possible and that this cannot take place unless the restrictions imposed by the Government are limited to those really essential to safeguard the public interests, without making the conditions so unattractive that capital cannot be secured with which to prosecute water-power projects.

It was pointed out in these columns last week that under the present acts of Congress covering federal permits for this purpose, developments have languished and it has been impossible to secure the investment of private capital even in many cases where permits had already been secured. The public generally, and probably many government officials as well, do not realize what a large investment is necessary in utilizing the power of an average water fall, especially where the head is low, and that unless the commercial conditions are extremely favorable such investments are not likely to yield as great returns as can be secured in other fields. These development and installation costs are far greater than for a steam plant and also the hazard of unexpected difficulties in the development are far greater. Such difficulties are well illustrated in the case of the Hale's Bar project of the Chattanooga & Tennessee River Power Company, which has finally been brought to completion after eight years spent in

overcoming difficulties. This development was described in last week's issue. On the other hand, operating costs are much lower in a water-power plant than in a steam plant and when the market conditions for power as regards location and time element of the load are favorable, water power has a distinct commercial advantage.

The interests which have been prominent in water-power developments, which are also largely those interested in electric utility corporations, must realize that the conditions which have hindered water-power development during the past ten years are largely a reaction from former conditions and from the former attitude and conduct of public service corporations. This attitude has happily showed a marked change during recent years and the prospect of cordial and friendly relations between such corporations and the public are quite bright for the future. The old attitude of such corporations, which usually involved the greatest privacy of their affairs, a disregard of the public rights and interests, participation in politics and frequent corruption of legislative and municipal office-holders, has engendered an antagonism which it will take years to eradicate.

The most radical exponents of public rights, as represented for instance in the person of Mr. Gifford Pinchot, have consequently a large and enthusiastic following who are inclined to swing the pendulum to the other extreme. They frequently not only want to put impractical and unduly onerous restrictions upon utility corporations but in many cases favor public ownership of such utilities. Even in states where the regulation of utilities by a state commission has been most eminently fair and satisfactory, as in Wisconsin, this tendency has not been stopped and the purchase of electric power plants and waterworks by municipalities still continues, as indicated in the department of Public Service Commissions this week. It should be realized that this advocacy of municipal or other public ownership does not rest mainly upon any expectation of lower rates or better service than under private ownership, but is inspired largely by a desire to eliminate the influence of such corporations from political affairs. For even where there are public service commissions there is often a fear that appointments will be influenced more largely by political considerations than by fitness for the office. It is true that the arguments of service and low cost are often used in agitations for municipal ownership and while disappointment frequently follows such expectations it must be realized that in other cases public ownership has indeed brought about such results. This is evidenced by the street railways in Cleveland (where the conditions are not far removed from public ownership, since the position of the stockholders of the railway company are little different from those of bondholders), the electric service in Seattle and Pasadena, and the telegraph service in England and in Mexico.

INCIDENTAL IMPROVEMENTS IN ELECTRIC LIGHTING.

Recent inspection of a number of electric lighting installations of the most advanced design operated on central-station service inspires one with enthusiasm as to the future of this branch of the industry. In the field of fixture design and manufacture effects are now available to suit a very wide range in prices; art and utility are combined to produce equipment which shall satisfy the most exacting demands, and the opportunities for development seem almost without bounds. Among these representative installations can be seen a tendency toward the control of lighting units which is of great value to the user; that is, in many cases close attention is being paid to the real conservation of light, to its use within narrowly restricted fields of vision, and to its application in locations where in the older days no lighting of a specialized character would have been provided.

Thus, in a moving-picture house representing a cost of many hundreds of thousands of dollars, the former practice of having the auditorium in pitch darkness, aside from the usual transparent red exit signs, has given way to the installation of a system of supplementary lighting on side aisles and under galleries which is a decided advance. Between the usual high-powered units set in bowl reflectors and the candelabra lamps thrown into circuit when it is required to illuminate the entire house, are independent units concealed in large degree by special reflectors. Under the galleries these supplementary lights are located just over the aisles, but are hooded from view with the exception of a slit at the front of the reflector which directs a thin band of light toward the aisle after the fashion of a dark lantern and thus provides just enough light by dispersion for the patron desiring to find a seat or to pick up his apparel prior to leaving. Looking toward the front of the auditorium the supplementary lamps are invisible, and practically no glare is encountered, even when the visitor to the establishment looks backward. In other cases, indirect fixtures are used.

On the side aisles the location of the supplementary units just below the edges of reflectors carried well above the level of the eye greatly improves the interior conditions, and on the balcony stairways and box interiors, the use of small lamps set behind art metal shields carried on brackets yields ample light by reflection from the adjacent wall without in the least disturbing the eyes of patrons in the body of the house.

In the hospital, also, notable improvements in lighting are being secured by the use of electricity, as noted in an article on this subject appearing in this issue. Semi-indirect fixtures impart a cheerful tone to wards impossible to secure with the old bare lamp, and by the use of a low-candlepower night lamp with frosted bulb in the ceiling at central points much of the old dread of protracted darkness is eliminated. Drop lights are no longer provided in private rooms or in wards as it is universally agreed that no source of light or illumi-

nated surface exceeding 0.1 candlepower per square inch should be exposed to the patient's eyes. In their place adjustable bracket fixtures with reversible reflectors and opaque sides are provided; or bedside lights with hemispherical reflectors, fully adjustable. General lighting is usually arranged to be controlled from suitable switches allowing two degrees of intensity to be available. In the operating room lamps in suitable reflectors are placed about the room so that cross lights will be obtained on the table and shadows reduced to a minimum. Only in abdominal operations, etc., where a penetrating beam of light is required,is localized lighting used and even in these fixtures manufacturers are inclining to the use of reflected light.

As long-hour customers the hospital and the photoplay theater are worth securing by the central station, and each offers an attractive field for special lighting applications.

DEVELOPING ELECTRICAL SPECIALTIES.

The number of special devices utilizing electricity in some way and available for light and convenient service in home, office or factory is now so great that they cannot be listed in anything but a huge volume or card index of vast dimensions, and even if the attempt were made to prepare a complete set of data upon this subject, it would be impossible to finish the task in the face of the present rate of electrical development. Every week new devices applying electricity are brought forth in the market, and the issue of patents continues at a rate which is at once the hope and the despair of the engineer and the producer of electrical energy for commercial service. This great tide of manufacturing and designing advance plainly shows that the future may be still more remarkable than the past in the popularization of electricity.

There is one phase of appliance development, however, which may well be considered in the interest of permanently popularizing specific devices. It is not enough today that an electrical appliance shall perform the mere technical work for which it is designed. The public taste is becoming more exacting. Finish must receive adequate attention, the shape, size, weight, shipping or mailing convenience of the device, adoption of the unit principle in connection with renewals, and the fool-proofing of the equipment all demand very careful consideration. The inventor of a meritorious device often overlooks these features. He sees the saving that the use of his product will bring about and immediately thinks that the world will make a beaten path to his door in search of his production. So it will, if the incidental points are duly taken into account in the manufacture of the appliance, but the delay may be very serious if the popular whims and desires of the moment are passed by without giving them due weight.

Thus one of the latest electric automobile models in preparation for the 1914 season attracts the purchaser largely on account of its body construction. The entire housing, including the roof, window frames, doors, panels, mud-guards, and steps is made of aluminum, shaped in form before being secured to the frame. There are no joints in the aluminum at the sash corners to work loose, as the sash pieces are cut from large sheets of metal. The moldings are put on in the most approved manner, and every nail and screw is headed over with aluminum, making the beading one continuous piece of metal. Here is an example, of course far removed from the small-appliance field, but none the less suggestive, of the importance of what might be called incidental details in the production and sale of a successful commodity, features here only distantly related to the comfort and convenience of the service to be had, although bearing directly upon the practicable mileage per charge through the reduction gained in weight. In the field of small motor service, lighting equipment for portable use, electric heating and numerous other branches of the art, there are an equally large number of incidental but vitally important features which cannot be set forth in detail here, but which the designer and manufacturer must consider with due imagination and with thorough testing under difficult conditions if he expects to maintain a standard article in the face of existing competition and inventive ability.

Just a few general points may be touched upon in emphasizing some of the desirable features of successful appliances. More attention needs to be paid in many cases to the shape of such devices and to the protection of the wiring from short-circuiting by careless use. The avoidance of exposed metal terminals; the study of sectionalization with the object of enabling spare parts to be instantly adjusted for service in place of the long and tedious process of doing without the device altogether while it is sent to the factory for minor repairs; the shaping of the external areas to fit snugly into carrying cases; the provision of hooks or eyes, handle shapes or other designs by which the apparatus if desired can be hung in a convenient place; the marking of the appliance with accurate and complete essential details of its service requirements in the way of voltage and current, if subjected to varying use on different distribution systems; the provision of rubber or cork tips or non-inflammable corners which can be used on finished table surfaces without scratching them; increased mechanical strength in receptacles and their attachment to the device—these and many other points gained by coming in contact with the user should be given their proper consideration in development. Nothing helps a high-grade device to maintain its selling price better, after it performs its guaranteed service, than that perfection in detail which the inventor may regard as unimportant, but which the central-station solicitor knows will often sell the appliance in competition with others of less cost.

Arlington Radio Station in Regular Communication with Paris.

Comparison of time by means of radio signals dispatched *via* the Arlington radio station, the tallest in this country, and the Eiffel Tower station, France, has been the subject of experiments since last April, and for four weeks signals have been regularly exchanged between Washington and Paris.

The purpose of the comparison is to determine the difference of longitude between the two places and to measure the velocity of propagation of radio signals through space. During most of the year atmospheric conditions are such that much interference is met with in transmissions, but the season is now approaching when these conditions are most favorable, and the success achieved recently makes it probable that the work planned between French and American scientists to carry this comparison to a point where accurate determinations are obtainable will be successfully completed.

The Washington Naval Observatory was the first institution to employ radio telegraphy for the transmission of its time signals to ships at sea to permit them to check their chronometers with that of the observatory and to more accurately determine their longitude. It also transmitted such signals to surveying parties under the hydrographic office to enable them to determine the longitude of points used as bases for surveys.

Meeting of A. I. E. E. Directors.

The regular monthly meeting of the Board of Directors of the American Institute of Electrical Engineers was held in New York City on November 14. President Mailloux announced the acceptance by Charles Proteus Steinmetz of the appointment as honorary president of the International Electrical Congress, and of Edward B. Rosa, as honorary secretary. The reorganization of the Executive Committee of the Committee on Organization of the Congress has been completed as follows: H. G. Stott, chairman; John W. Lieb, Jr., vice-chairman; C. O. Mailloux, chairman of the Subcommittee on International Relations; A. E. Kennelly, chairman of the Subcommittee on Program; Henry A. Lardner, chairman of the Subcommittee on Pacific Coast Relations; H. H. Barnes, Jr., chairman of the Subcommittee on Transportation; George F. Sever, chairman of the Subcommittee on Entertainment; Preston S. Millar, secretary-treasurer and chairman of the Subcommittee on Publicity; F. L. Hutchinson.

The Board authorized the holding of Institute meetings, in addition to the New York monthly meetings and the midwinter and annual conventions, as follows: Washington, D. C., April 10, 1914, under the auspices of the Electrophysics Committee; Pittsburgh, Pa., April 23-24, 1914, under the auspices of the Pittsburgh Section and Committee on the Use of Electricity in Mines; Pittsfield, Mass., (date not fixed) under the auspices of the Pittsfield Section; Spokane, Wash., September, 1914.

Thirty-five applicants were elected Associates and 165 students were ordered enrolled. There were 12 transfers and elections to the grade of Member, and six to the grade of Fellow.

A resolution was presented and adopted referring to the death of Sir William Henry Preece, who had been an honorary member of the Institute since 1884.

The president was authorized to appoint three representatives upon the recently organized United States National Committee of the International Illumination Commission, and $100 was appropriated towards its expenses.

A Railway Committee was appointed, with F. J. Sprague as chairman, and a Committee on Electric Illumination, with Clayton H. Sharp as chairman.

Electric Club of Chicago.

Lorado Taft, noted sculptor, addressed the Electric Club of Chicago at its regular meeting on November 20, on the subject of "Beautifying Chicago." Mr. Taft spoke of the important part that electricity plays in the beautification of a city, particularly at night, although he thought there is a tendency toward vulgarity in some of the spectacular signs erected in our larger cities. He referred at some length to the plan originated by him for beautifying South side boulevards.

The report of the Nominating Committee was presented at this meeting by Homer E. Niesz, chairman. The following candidates were selected for the respective offices mentioned:

President, A. R. Bone.
Vice-president, William C. Berry.
Secretary, Howard Ehrlich.
Treasurer, F. W. Harvey, Jr.
Board of Managers: Fred M. Rossleland, H. L. Judd, A. R. Dean, S. Gardner, and R. I. Phillips.

At a meeting of the Electric Club, Chicago, on November 13 the speaker of the day was Henry M. Hyde, an editorial writer for *The Chicago Daily Tribune*. His subject was "Relations Between the Press and the People." Mr. Gore, of the Chicago Association of Commerce, spoke on behalf of that body, a number of whose members were present.

Rivers and Harbors Congress.

The tenth annual convention of the National Rivers and Harbors Congress will take place in Washington December 3, 4 and 5 next, and it is expected that the subject of water power will play a prominent part in the gathering.

At the congress last year, Henry L. Stimson, then Secretary of War, launched a plan for the Federal Government to build a number of power plants along the Mississippi River, with a $50,000,000 appropriation by Congress, to be operated by the Government, and power sold to users along the river, the surplus income to be devoted to paying the expense of building levees and otherwise caring for the Mississippi River during flood seasons.

This project is expected to be advocated again at the coming Congress.

President Wilson has promised to speak. He is to make the opening address and is expected to publicly outline the policy of the administration as to river and harbor improvement and appropriations therefor.

Lynn Section Meeting.

On the evening of November 19, in the course of lectures being conducted by the Lynn Section of the American Institute of Electrical Engineers, D. L. Galusha delivered a lecture on "The Hydroelectric Development at Keokuk, Iowa." Mr. Galusha, as engineer of electrical installation of this project for the Stone & Webster Corporation, is well fitted to speak on the subject, and in a carefully prepared address, illustrated by lantern slides, gave a thorough review of this important work. The meeting was held in Burdett Hall.

The next meeting will occur on December 3, when J. A. Orange will give a talk on "Nitrogen-Filled Tungsten Lamps."

Jovian League of Chicago.

At the meeting of the Jovian League of Chicago on November 24, a set of by-laws to govern the conduct of the club were presented by Homer E. Niesz, statesman for Illinois. Action was deferred until the next meeting. Several suggestions were made relative to financing the club and it was finally decided to enlist a "sustaining membership" to be called upon in case funds are necessary.

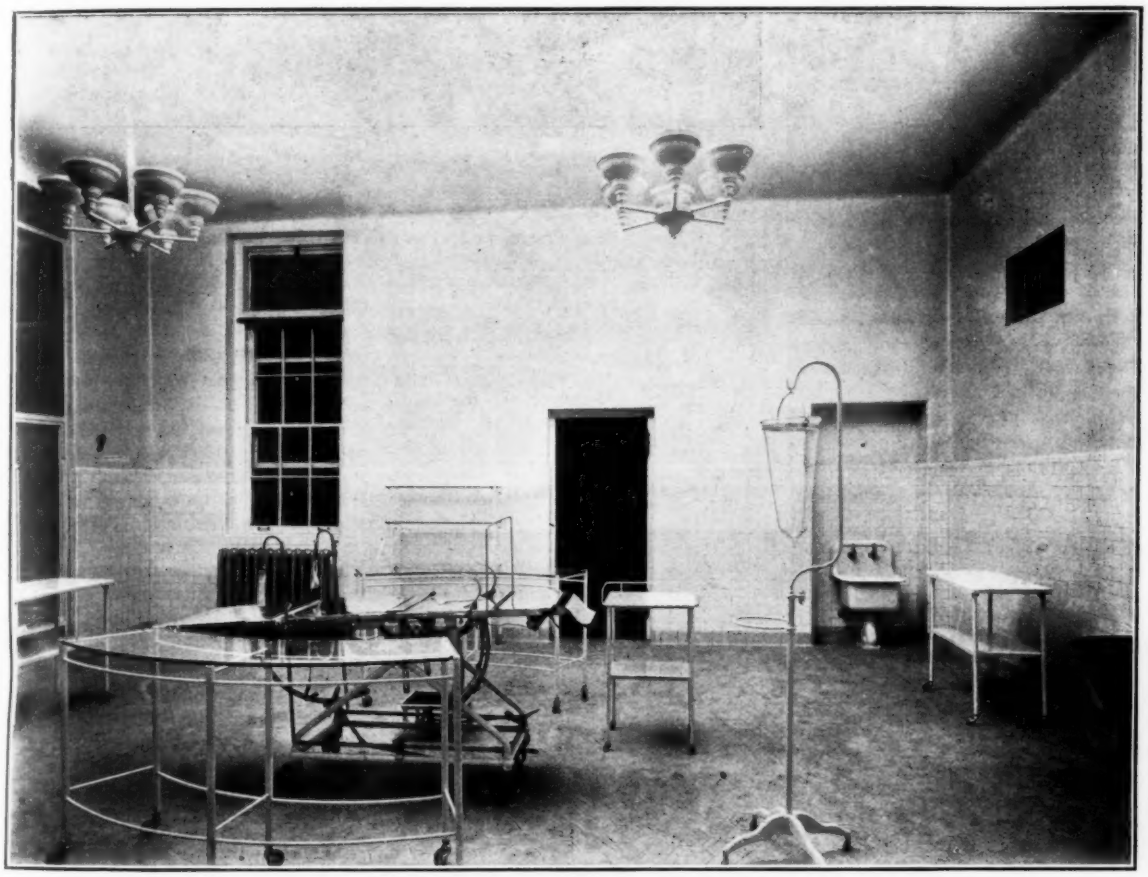
It was voted to hold four stated rejuvenations during the year in the months of December, March, June and September. The first will be held on Monday, December 15, and the class for initiation will be limited to 50 candidates.

Electricity in Hospitals

For some unexplainable reason the question of proper artificial illumination for hospitals has not been given the same thought and attention that has made the modern institutions models of elegance and hygienic forethought. It is true that recently architects and engineers have given the subject of lighting considerable more attention than ever before but nevertheless hospitals continue to be constructed in some instances without due regard to modern illuminating engineering principles.

It is a significant fact that the same thought and attention which have made modern hospitals models of elegance and hygienic forethought have been lacking in even the largest and most complete institutions as regards illumination. Ordinary illumination devices fail to give the proper quality and distribution of light for hospitals, especially in the operating rooms and wards.

Hospital lighting may be divided into three general classes, namely ward lighting; operating room lighting and general lighting in such rooms as kitchens, offices, corridors, service rooms, toilet rooms, linen rooms, etc. While good lighting is essential in every department of a hospital, the greatest importance, of course, attaches to ward and operating-room lighting and many special problems have to be worked out.



Operating Room at Toronto General Hospital Lighted by Indirect Units.

Ward Lighting.

In the wards the evils of glare have to be most carefully avoided, as the influence of glare upon the retina of the patients is usually followed by serious results.

The average ward of 20 beds should be provided with two kinds of illumination, general and localized. The general lighting should not average more than one foot-candle and should be obtained from either a totally or partially indirect source, so arranged that violent contrasts are entirely eliminated. It is advisable that the ceiling be treated with a flat white or French zinc surface and the walls in a slightly darker tone, such as buff or French gray.

The fixtures must be of special design, along plain, smooth lines, thus avoiding the septic risks of dust collections and rendering it easily and thoroughly cleaned. Also that portion of the light which is diverted to the ceiling must be evenly distributed without spots and streaks. The exterior finish should be a restful color such as green enamel or matt nickel. This will not give a violent contrast, and will overcome the sameness of the white-enameled finish which is thought by many to be necessary for hospitals.

It has proven very satisfactory in large installations to control each fixture by an electrolier switch on the wall, arranged to give at least two intensities of illumination.

(1) A very low intensity, possibly 0.25 of a foot-candle, to enable the nurses at night to wait on the patients.

(2) A higher intensity, for reading,

etc., of approximately two foot-candles.

For the localized lighting of the ward the two forms most advisable are proper brackets or bedside lights. No source of light or illuminated surface exceeding 0.1 candlepower per square inch (14 candlepower per square foot) should be exposed to a patient's eye; therefore, the usual direct lighting equipment is quite out of the question. In some installations an adjustable bracket-type of fixture, equipped with a reversible glass reflector with opaque sides, is used. The reflecting portion is of a concentrating type, designed especially for bedside examination, thus eliminating any necessity of the use of a special portable lamp by attending physicians; and by reversing directly upward this concentrated light is directed to the ceiling, thus giving an excellent form of indirect illumination.

The opaque sides render it impossible for a ray of light to reach the eye of a patient in any part of the ward and enable any bed to be immediately illuminated without any disturbance to other patients.

Bedside lights are the least desirable for localized equipment, but where absolutely necessary, they should be carefully designed. The reflector portion should preferably be hemispherical in form, opaque and mounted on a plain standard heavily weighted at the base. The reflector should be adjustable by means of a knuckle joint. The reflecting surface should give a diffused reflection as from opal glass or flat white enamel.

Private Room in Hospital with Indirect Fixture.

While practically all are agreed that direct lighting for hospital wards is not to be considered, there is some difference of opinion as to the merits of totally indirect and partially indirect lighting. M. J. Sturm, a noted hospital architect, strongly advocates the semi-indirect system because of the psychological factors involved. So far as the amount of illumination is concerned, while a very small percentage of increase would be obtained by the semi-indirect method, still the mental equation cannot be eliminated. A wholly indirect system, while it gives increased illumination primarily over a semi-indirect system so far as the indirect component alone is concerned, leaves the occupant of the room with a "sense" of darkness; not that there is this darkness, but the fact that the eye has been trained from time immemorial to the direct light. In other words, the source of light has been evident at all times to the occupant of the room. It is purely a mental condition but is one of the factors that must be taken into consideration.

Corridor Lighting Showing Signal Lamps Over Each Door.

Speaking of this particular phase of hospital illumination before the Chicago Section, Illuminating Engineering Society Mr. Sturm said that the subject is of the utmost importance "inasmuch as the first requisite in hospital construction, equipment, and management, is that there should be everything consistent to bring about tranquility of mind of the patient in order to assure his recovery. Modern medicine and therapeutics absolutely put this as a first factor in the recovering of the patient, especially in diseases which are more or less of a character as developed in neurasthenics; that is in diseases where there is no cure except natural methods of treatment, and all cases in hospitals are to some extent subject to this condition.

"You can therefore see the necessity of having everything in hospital equipment of such a character that it will do the most toward the recovery of patients, and one of the most disturbing factors to the patient is the fact

Adjustable Tungsten Cluster in Operating Room.

that while there is illumination there is something missing from what the mentality of the patient feels should be there.

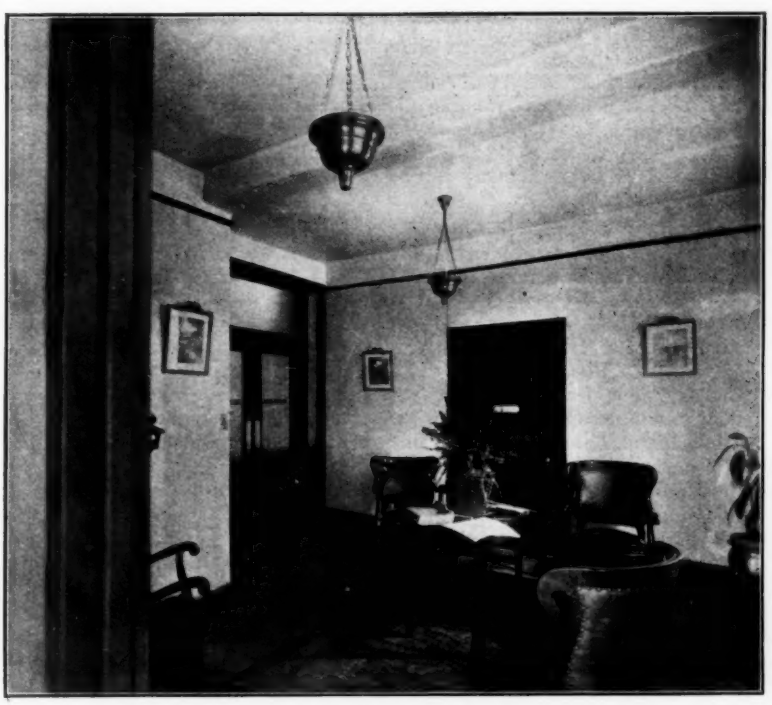
"Therefore it seems that the semi-indirect system should be advocated and there is no reason why this system cannot be developed as highly as the fully indirect. It is as artistic and somewhat more efficient. In addition to this the partially direct unit can be used more readily as a night light or a subdued light in the rooms and wards. Under any circumstances for the reasons given, the source of light should be directly illuminated, but this should not be more than 10 per cent of the entire intensity of the illumination. So-called semi-indirect lighting systems which have for their object only the attainment of the artistic, and in which fully 50 per cent of the light comes through the bowl, while they have their proper place and functions, are not well adapted to hospital lighting in wards and rooms."

As previously mentioned, the general lighting in the ward, or in private rooms should average about one foot-candle. One specialist in hospital illumination has come to the conclusion that a standard method can be employed for deriving proper illumination for the ward and private room. All calculations on the basis of foot-candles of intensity are eliminated and instead the area to be lighted is used as the basis for figuring, allowing 0.75 to one watt per square foot of area, depending upon the local conditions.

From a practical standpoint in working out this problem of the intensity of light, if an ordinary room, 11 feet wide and 18 feet long, were taken as an ordinary sized private room, and the ceiling height was from 10 to 11 feet, the square foot area would be practically 200 square feet, and with an illumination of 0.75 watt per square foot the total wattage for the room would be 150. Figured according to the Undrewriters' requirements that a 16-candlepower lamp should be rated at 60 watts outlets are provided for three lamps and the electrical contractor is instructed to wire for three lamps. Basing the wattage on foot-candles it is apparent that with an 11-foot room with a 10-foot ceiling we get 1.1 as the factor where the least dimension of the room is divided by the ceiling height and from tables carefully calculated we find 0.75 watt per square foot will give a rated intensity of 1.75 foot-candles at bed height, which would be good illumination for this room.

Necessarily, in larger wards the same calculations would hold, but the room should be divided in such manner that the lighting outlets will be placed for the most efficient illumination in such rooms. In a room 18 feet by 22 feet, for instance, having approximately 400 square feet of floor area, by using 0.75 watt per square foot as the basis a wattage of 300, or the equivalent of six 50-watt lamps, are required. Manifestly the best method of procedure would be to install two outlets, dividing the room into fourths and putting the first fixture at about 5.5 to 6 feet from the wall on each side, on the central line of the room. By the same process of figuring, it is found that with the illumination specified, an intensity of 2.5 foot-candles is obtained over the entire area of the room.

Much has been said relative to the covering of bowls and reflectors in hospitals to prevent dirt and micro-organisms from lodging in the bowls. It seems to be the opinion of some that this is entirely unnecessary for two very good reasons. First, a per-



Waiting Room in Hospital.

centage of the illumination is lost through absorption, due to the fact that dust will settle on the glass above, and the radio activity is decreased through this absorption more than it would be if the same amount of dust collected on the reflector.

However, due to the fact that there is a constant current of air set up by the heat of the lamps, there will be less dust settle on the reflector than on the glass over the bowl where covers are omitted.

The second reason why covering of reflectors is unnecessary is that many experiments in putting cultures of various forms on the reflectors have proven that such micro-organisms have been destroyed in a very short time due to the action of the light rays.

The only point of consideration, then, remaining, would be one of simple cleaning, and while it might be somewhat easier to wipe off the top of the glass bowl or cover, this would not have to be done so often without this cover, inasmuch as the self-cleaning factor enters largely into the permanent cleanliness of the lighting unit. All equipment, however, should be of the simplest possible design, from the standpoint of accessibility for cleaning.

Operating Rooms.

Operating rooms should have, on account of the large amount of surgical work performed at night, a system capable of concentrating on the field of operation an illumination intensity which some authorities insist should be as high as 25 foot-candles, and of approximately the color of daylight. The equipment should be designed along plain lines, rendering it easily and thoroughly cleaned. When it is necessary to suspend a fixture in close proximity to the table and when over 250 watts are consumed by the equipment, it is most important that the heat generated by the lamp be directed away from the patient and the head of the surgeon.

Some hospitals object to any suspended lighting equipment in the operating room; this usually applies to rooms having a skylight, and provided sufficient head room is available a satisfactory system may be designed by placing a series of reflectors around the edge of the skylight. Such an arrangement with additional reflectors outlining the window has been provided in the new Louisville (Ky.) City Hospital and it is expected by the architect that no glare or reflection will be encountered. An adjustable table fixture containing six 100-watt lamps and emergency gas lights are also provided.

In such installations reflectors may be so designed that the maximum reflection falls at a point directly over the table. This scheme is likely to be more satisfactory than an attempt to illuminate the entire skylight so as to provide a sufficient amount of light for an operation in any part of the room. The latter scheme would necessitate a large energy consumption, but many satisfactory installations of the kind have been made.

For the proper illumination of the operating room cross light is necessary so that all shadows will be eliminated as far as possible. Realizing this several systems have been proposed and are in use, in addition to the systems already mentioned. An ingenious system of mirrors so placed that the rays of light from each side of the room would be diverted to the opposite side of the table has been employed in a few installations with successful results. Tube lighting installed entirely around the room has also been successfully employed.

In many hospitals totally indirect lighting is used. Notable examples in this connection are the Toronto (Canada) General Hospital and the Harper Hospital of Detroit. Nine of the operating rooms of the former are equipped with a simple type of indirect fixture. A typical room, 20 by 24 feet, with a ceiling height of 14 feet is equipped with two fixtures each containing six 150-watt clear-bulb Mazda lamps. The watts per square foot are 3.75 with an average intensity throughout the room of 10 foot candles.

Miscellaneous.

The lighting of halls and corridors is in a class with the lighting of hotels and office-building corridors. The nurses' and doctors' quarters should receive the same careful treatment required for the home. The dispensary should be given the same treatment as the modern drug store; particular attention should be given to the lighting of the prescription counter.

In the larger hospitals power applications are somewhat numerous but are so well known that they do not need special comment here. No difficulties are encountered in applying motors to ventilating fans, pumps, elevators, kitchen equipment, etc.

Commercial Practice
Management, Rates, New Business

Growth of Faribault (Minn.) Plant.

The gas and electric properties at Faribault and electric properties at Northfield and Cannon Falls, Minn., were taken over by H. M. Byllesby & Company in December, 1909. These utilities formed the nucleus of what is now the Faribault Division of the Consumers Power Company. At the time of assumption of management the combined properties had 692 gas customers and 1,569 electric customers. Arrangements were made for the construction of a water power on the Cannon River at Cannon Falls having initial capacity of 1,500 horsepower. This was completed early in 1911 and transmission lines from it now traverse 125 miles, serving the original properties and those which have since been added.

Faribault in 1910 was only fairly developed as to the use of gas—there being but one gas meter to every 13 of population. In July, 1912, a high-pressure gas line was completed to Northfield and 189 customers ready for service were connected. Today there are 458 gas customers in Nortfield and the two towns together show an increase of 120 per cent in number of customers for the four years. There is now one gas meter in service for every 8 population served.

Results in the electric department show a high degree of development, particularly in the growth of power business. In January, 1913, the towns of Morristown, Waterville, Janesville and Zumbrota were added to the lines of the company. The increase in population served (including the new towns, for the four years was 37 per cent, customers increased 82 per cent, kilowatts-lighting load 97 per cent, horsepower in motors 489 per cent; total kilowatts all purposes connected

167 per cent. There are now 203 miles of pole line, as compared with 40.2 miles in February, 1910. There is one meter to every 6.6 of population served as compared with 8.9 in February, 1910. Receipts per meter have increased 20 per cent. The output for the week ending November 4 was 82,420 kilowatt-hours, an increase of 74 per cent over the corresponding week of 1911.

Electricity in the Garage.

The large part which electricity plays in the modern automobile garage was indicated recently with the opening of the plant of the Southern Motors Company, of Louisville, which has the largest garage and service station in the South. The concern uses so much power, in fact, that it seriously considered establishing its own plant, but finally decided in favor of central-station service, receiving current from the Louisville Gas & Electric Company. It has a large number of motors used in operating its heavy-duty freight elevators, cleaning machinery, battery charging apparatus, battery building outfits and other appliances. During the construction of its new building, motors were used to operate the concrete mixers and the hoists which carried the material to the upper floors. Nearly 200 Mazda lamps are used in the plant, a handsome indirect lighting system being used for the office and show-rooms. L. L. Files is president of the Southern Motors Company, which handles the Detroit electric, and sells only cars which are electrically lighted. Most of them are equipped with electric starters.

Louisville Company to Supply New Albany.

The Louisville (Ky.) Gas & Electric Company has made a contract with the Louisville & Southern Indiana Traction Company to furnish power needed for the operation of the lines between Louisville, and Jeffersonville and New Albany, Ind. The contract is progressive in its nature, the power company furnishing 500 kilowatts until March 1, 1914, and 1,000 kilowatts after that date.

The plan was decided on in order to enable the traction company to take care of its power requirements without the necessity of adding to its own plants. The Louisville Gas & Electric Company has had under consideration a proposition to furnish power for the Louisville Railway Company's operations, but it is understood that the latter, which is completing a new plant, does not look with favor on such a move.

Psychology in Advertising.

Touching on the field of psychology in advertising, Dr. Muensterberg of Harvard University, in a speech on November 19 to the students of the New York Edison Company's commercial school, on "Applied Psychology to Business," told of some experiments just completed at Harvard on the subject of magazine advertising. The object was to determine whether it is really good to mix reading matter with advertisements, as is becoming a common custom. The sample books of 100 pages each were made up. In the first book four advertisements were placed on each page; in the other volume, two advertisements and two "funny pictures" on each page. Fifty students were made to go through each volume and on finishing write down the name of the firm and subject of as many advertisements as they could remember. Results proved that the plain advertising pages, unmixed with reading matter, gave a better result by nearly 33 per cent.

Growth of Business of Mobile Electric Company.

The Mobile Electric Company has made an increase of 15 per cent in output of electrical energy since the management of the property was assumed by H. M. Byllesby & Company in 1906. This has been accomplished with an approximate increase of only 18 per cent in population served and an increase of 53 per cent in number of customers.

The company was organized in May, 1906, combining two electric companies which were formerly engaged in competition.

When the management was assumed by H. M. Byllesby & Company, the output of the combined companies was averaging 84,000 kilowatt-hours weekly. For the week ending November 15, 1913, it was 216,218 kilowatt-hours. The combined load of the two properties at the time they were merged, as compared with the connected load of the Mobile Electric Company on September 30, 1913, is shown below.

During the past year the company has installed new coal and ash-handling machinery of the latest type in the powerhouse, which has enabled a reduction in the operating force and produced better coal economy. This has decreased operating expenses materially and the increase in net earnings has been greater proportionately than the increase in gross earnings.

	May, 1906.	Sept., 1913.	Increase.	Per Cent Increase.
Number customers	4,293	6,595	2,302	53.6
Kilowatts lighting load connected	4,126	8,397	4,271	103.
Horsepower motor load connected	1,100	4,522	3,422	311.
Total kilowatts connected	4,946	11,771	6,825	137.
Miles of pole line	107	136	29	27.

New Street Lighting in Newark.

The Public Service Electric Company, by direction of the Board of Works, has installed a system of new arc lamps on Broad Street, Newark, N. J., supplanting the flaming arcs formerly used. The new lamps are Type W focusing arcs, the reflector being placed above the carbons. The lamps are placed on poles of ornate type, which also support the trolley wires, being designed to withstand the vibration caused by the span wires. The present installation comprises 66 lamps, which will immediately be increased to 80 when alterations now in process are completed to the sidewalk along Military Park. The system will be placed on an all-night schedule.

Increased Business Northern Idaho & Montana Power Company's Subsidiaries.

A comparison of the Oregon Power Company's (Marshfield Division) business for the first six months of 1913 with the first six months of 1911 shows an increase of 41 per cent in gross earnings and an increase of 64 per cent in net earnings.

The Dallas, Oregon, division of the Oregon Power Company shows a gain of 40 per cent in connected load since the first of the present year. The divisions output of electrical energy for the week ending November 4 showed a gain of 62 per cent over the corresponding week of last year.

Electric Power Helps Reduce the Cost of Cement.

As the result of the collapse of the syndicate or trust which has controlled the German Portland-cement industry, the price of this material has dropped to one-half and even less than half of what it was when the trust was in full swing. The increased use of electric power in cement production is credited as an important contributing factor in making the lower cost possible.

Western States Gas & Electric Company Gets New Street-Lighting Contract.

The city council of Eureka, Cal., has renewed the contract with the Western States Gas & Electric Company for street lighting. The contract specifies 203 or more arc lamps at $60 each per year.

GRAPHICAL CHART OF POWER COSTS.

By J. P. Ripley.[1]

The cost of electrical service may be divided generally into two parts, the first being represented by more or less fixed costs such as interest, depreciation, taxes, insurance, superintendence, and general expenses, all of which depend largely upon the investment in power station and distributing system; the second being represented by costs, which are of a variable nature such as labor, fuel, water, lubricants, maintenance, etc., which vary somewhat directly with the amount of electrical energy delivered to the consumers. Thus if it is to be assumed that each consumer of energy distributed from any given central station is to pay from month to month, proportionately to the cost to the central station of providing electric service, it seems logical that, in view of the fact that load-factors of various services may vary over a wide range, each consumer should be charged a fair amount to cover the more or less fixed charges on that portion of the power station and distributing system held in reserve for his service, as well as a supplemental charge to cover the cost of delivery of the particular amount of electrical energy consumed. These two separate charges are termed respectively, demand and consumption charges.

Such charges for electrical service may be said to be somewhat analagous to the basis upon which railway freight rates are made, for instance; the differentiation between relative weights and volumes is provided by the classification of freight; fixed charges on terminal investments are represented by terminal charges; and extra overhead expense of handling small shipments is provided for by the differences between carload and less-than-carload rates. In charging for the transportation of freight, however, the value of the commodity transported has a bearing on the rate charged, this being taken care of by freight classification, whereas, in the case of electrical service the commodity itself has no value whatever, the value of the service being due only to the flow of electricity actuated by electromotive force. Thus it might be said that, in the case of electrical service, only the transportation of the commodity and not the commodity itself, is of value to the consumer. Charging in accordance with the value of the service, or, as usually termed in speaking of railway traffic, charging "what the traffic will bear" may have no bearing on the use of demand and consumption charges, but only on the amounts of those charges. In electrical service an analogy to charging "what the traffic will bear" might be found in the taking on of consumers at low rates unprofitable in themselves, but which would nevertheless improve the net result.

Various methods for computing the power demand charge are in use; it is sometimes based upon the maximum instantaneous peak, sometimes upon the maximum peak load lasting over an agreed period of time and sometimes, although not frequently upon the maximum allowable power demand. The demand charge is made both on a horsepower and kilowatt basis, some consumers preferring the former, due to their greater familiarity with the horsepower as a unit. The consumption charge, however, is quite generally calculated in terms of the kilowatt-hour.

The graphical chart of power costs illustrated herewith has been constructed for the rapid calculation of either unit or total costs within comparatively small limits of possible error, and may be used in estimating earnings from power installations and in checking power costs that are figured numerically.

In the calculation of power costs upon a demand and consumption charge basis the following items enter into the problem: (1) demand charge; (2) consumption charge; (3) power demand; (4) energy consumption; (5) total cost; (6) equivalent unit cost; (7) load-factor.

Given any of the above items which it would be necessary to have in an ordinary mathematical calculation to obtain a desired result, it is possible by the use of the chart to eliminate all calculation and quickly obtain the desired answer, as indicated in the following examples.

Examples.

(1) Assuming:
Consumption charge.....
.....$0.005 per kilowatt-hour
Load-factor.....40 per cent
Demand charge.....
.....$12 per kilowatt per annum

To find equivalent unit cost per kilowatt-hour.

Starting at given consumption charge in upper right quadrant; follow vertically downward to intersection with the proper load-factor line[2]; then follow horizontally to the left to intersection with the proper demand charge in the upper left quadrant; then vertically downward (or upward) to intersection with the proper load-factor line in the upper left quadrant; then horizontally to the left to the value of the equivalent cost per kilowatt-hour given on the left scale, the answer being $0.00841.

(2) Assuming:
Consumption charge.....
.....$0.004 per kilowatt-hour
Load-factor.....60 per cent
Demand charge.....
.....$20 per kilowatt per annum
Power demand.....600 kilowatts

To find the power cost.

Starting at the given consumption charge in upper right quadrant; follow vertically downward to intersection with the proper load-factor line; then follow horizontally to the left to intersection with the proper demand chage in upper left quadrant; then vertically downward to intersection with the proper power-demand line in lower left quadrant; then horizontally to the left to value of total power cost given on the left scale, the answer being $24,614.

(3) Assuming:
Charge based on average load....
$30 per kilowatt per annum (or $22.50 per horsepower per annum)
Load-factor.....65 per cent
Demand.....100 kilowatts

To find total power cost.

Starting at the given average annual charge, in kilowatt or horsepower in the upper right quadrant, follow horizontally to the left to intersection with proper load-factor line; then follow vertically downward to intersection with proper power-demand line, in lower right quadrant; then horizontally to the right to value of total cost of power per annum on the right scale, the answer being $1,950.

(4) Assuming:
Charge based on average load....
.....$30 per kilowatt per annum
Load-factor.....65 per cent

To find equivalent demand charge per annum on a maximum-demand basis.

Starting at the given average charge per annum in the upper right quadrant, follow horizontally to the left to intersection with the proper load-factor line; then follow vertically downward to scale at bottom of right lower quadrant to equivalent demand charge per annum, the answer being $19.50.

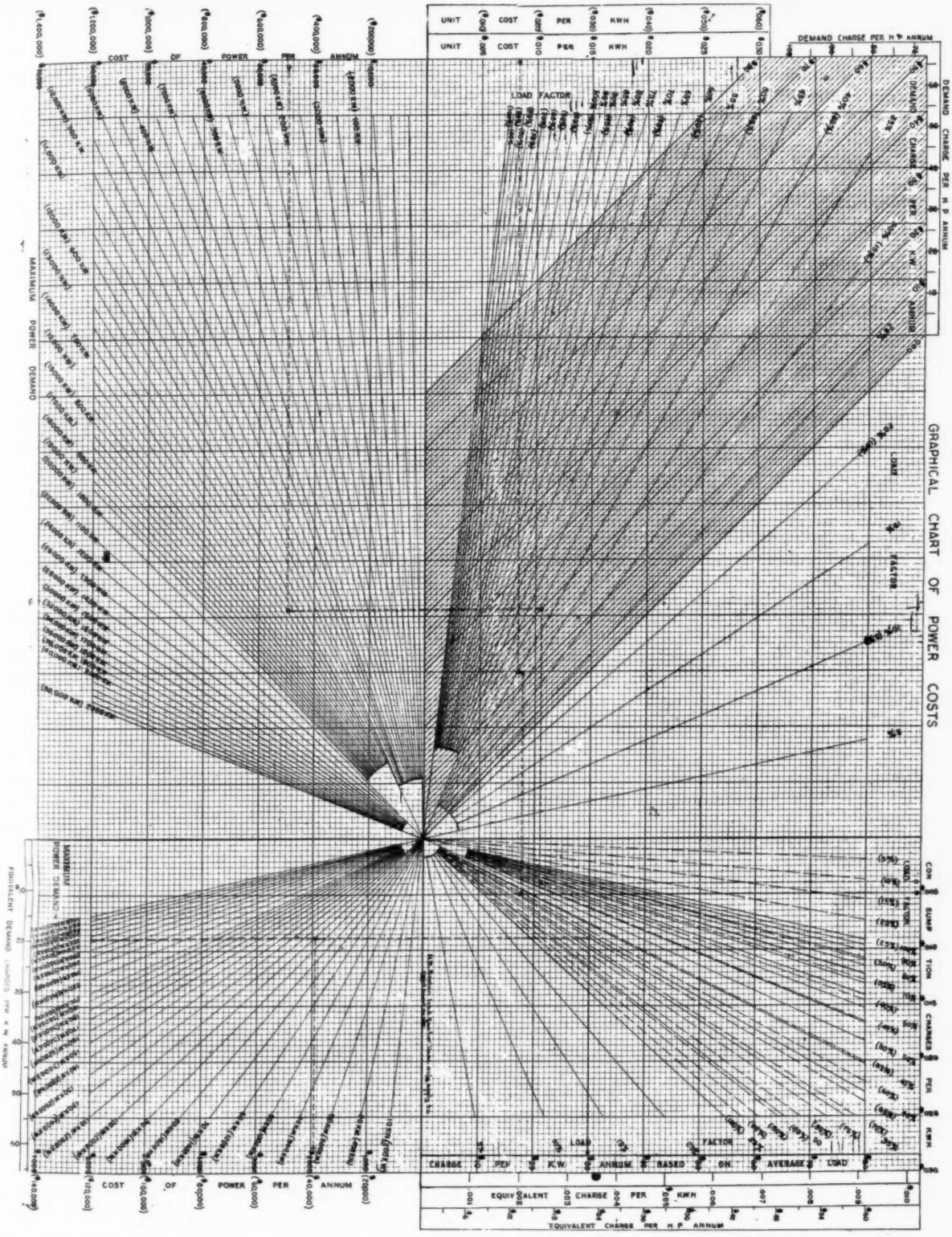
Examples (3) and (4) are possible of solution by the use of mental arithmetic, but are included to illustrate the use of the chart in such problems as well as in the case of problems involving consumption and demand charges.

1 Of the J. G. White Management Corporation.

2 Use full lines in connection with unbracketed figures and dash lines with figures in brackets.

Northern Illinois Street-Lighting Contracts.

The Illinois Northern Utilities Company, of which Charles B. Youts is general contract agent, has recently closed street-lighting contracts covering a period of 10 years in Belvidere, Harvard, Capron, Kingston, Kirkland, Earlville, Adeline and Mount Morris. Special ornamental street lighting is now being conducted in Belvidere, Sterling, Fulton, Oregon, Genoa, Plano and Earlville. Street-lighting installa-


GRAPHICAL CHART OF POWER COSTS
MAXIMUM POWER DEMAND
DEMAND CHARGE PER H.P. ANNUM
LOAD FACTOR
COST OF POWER PER ANNUM
UNIT COST PER KWH
EQUIVALENT CHARGE PER H.P. ANNUM
CHARGE PER KW. ANNUM BASED ON AVERAGE LOAD

tions have recently been completed by the company in Fulton, Amboy, West Brooklyn, Franklin Grove, Forreston, Somonauk, Leland, Sandwich and Dixon. Ornamental-street-lighting contracts have recently been completed in Amboy, Dixon, Harvard, Forreston and Franklin Grove.

Municipal Plant Shuts Down.

The Town of Wakefield, Mass., has voted to discontinue the municipal light plant for one year and buy current from an outside company. It is claimed that the cost of energy will be reduced one-half, and that as the result the rates to consumers in Wakefield will be materially reduced.

Electrical Construction

ELECTRIC SERVICE FROM THREE - WIRE DIRECT - CURRENT GENERATORS.

The Equipment of a Modern Isolated Plant.

The cost per pound of conductors for the distribution of electric energy is sufficiently large to make it highly desirable always that circuits be laid out with a view to using as few pounds of the conducting material as is consistent with good practice in matters of securing the necessary mechanical strength in the wires and of preventing excessive waste of energy in the transmission and distribution lines. Efforts to secure the greatest possible economy in cost of conductors gave us the three-wire system of distribution for direct-current service, and the saving in the cost of the necessary conducting material accounts for its present popularity.

The exact saving in line material that the use of three-wire distribution affords in direct-current work—and in single-phase alternating-current service—and the reason for this saving, are things that any practical electrician can very well afford to take time to familiarize himself with. The matter is a simple one. In order to show how simple it is the following example is inserted.

Comparison of Two-Wire and Three-Wire Systems.

Consider the circuit shown in Fig. 1, where, to make the computation easy, the quantities used have been selected for simplicity rather than with any intention of using values that would be found in an actual, working circuit.

It should be remembered that the watts lost in an electric circuit is found by multiplying the current by itself (squaring it) and then multiplying this product by the resistance of the circuit. Thus, the loss in the circuit of which *AB* and *DC* are the two conductors is

$$P=I^2R=10^2(0.5+0.5) \text{ or}$$
$$P=100 \text{ watts.}$$

Now assume that the same lamps shown in Fig. 1 are connected as indicated in Fig. 2; and assume further that the wires *EF* and *GH* must be of such a size that the loss of power in them is also 100 watts. What would be the resistance of these two wires? Calling this resistance *X*, we have

$$5^2X=100; \text{ or}$$
$$X=4 \text{ ohms;}$$

which means that the wires, with the arrangement shown in Fig. 2, would be only one-fourth, or two-eighths, as heavy for the same line loss as in the connection illustrated in Fig. 1.

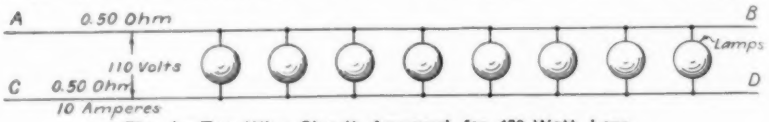


Fig. 1.—Two-Wire Circuit Arranged for 100-Watt Loss.

If now a middle wire of the same size as *EF* or *GH* were added, as in Fig. 3, the weight of copper required would obviously be three-eighths of the weight of the copper required in the two-wire circuit of Fig. 1.

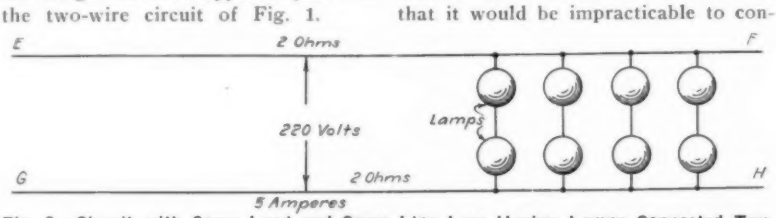


Fig. 2.—Circuit with Same Load and Same Line Loss Having Lamps Connected Two in Series.

Thus it is seen that by means of three-wire distribution a saving of five-eighths, or approximately 63 per cent, in the cost of copper is effected. Where the neutral wire can be made smaller than the outside legs of the circuit, the saving is still greater, of course.

Single-phase alternating current lends itself very readily to three-wire distribution if transformers are used, as is generally the case. Standard, pole-type transformers are arranged, as a rule, for tapping on a connection at the middle point of the secondary winding, and here the neutral of the three-wire system may be brought out.

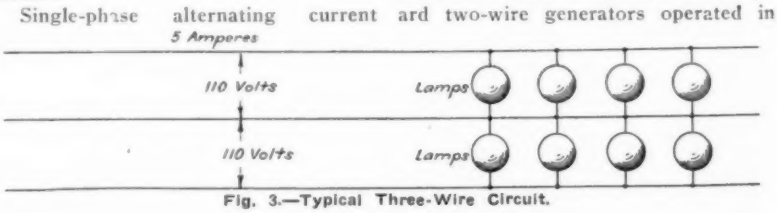


Fig. 3.—Typical Three-Wire Circuit.

One of the oldest schemes of direct-current three-wire service consists in connecting two direct-current generators of equal voltage in series and bringing the neutral out from the point where the two machines are connected together. For the lighting of small, compactly built villages this arrangement may be quite satisfactory and efficient. It is easy to arrange the switchboard so that one of the two dynamos can be shut down when the load falls below half the normal capacity of the plant and the remaining lights carried on the other generator. This would mean, however, that it would be impracticable to connect motors across the outside legs of the circuit. The fact is, this arrangement is an old one which does not seem to find extensive use now.

Present practice in direct-current engineering favors the use of either three-wire generators where three-wire distribution is wanted or of standard two-wire generators operated in conjunction with rotary-balancer units. One or the other of these two arrangements is found in a very large proportion of all the isolated plants which serve a single large building. Each arrangement has its own advantages; an important advantage common to both is that any number of generators may be run in parallel

on the same busbars, thus making it convenient to add machines as the load increases, and to pull off any unit that may be temporarily disabled without interfering with the service. In other words, it is not necessary to run generators on very light loads, and consequently at low efficiency, much of the time, and it is easy to provide for absolute continuity of service.

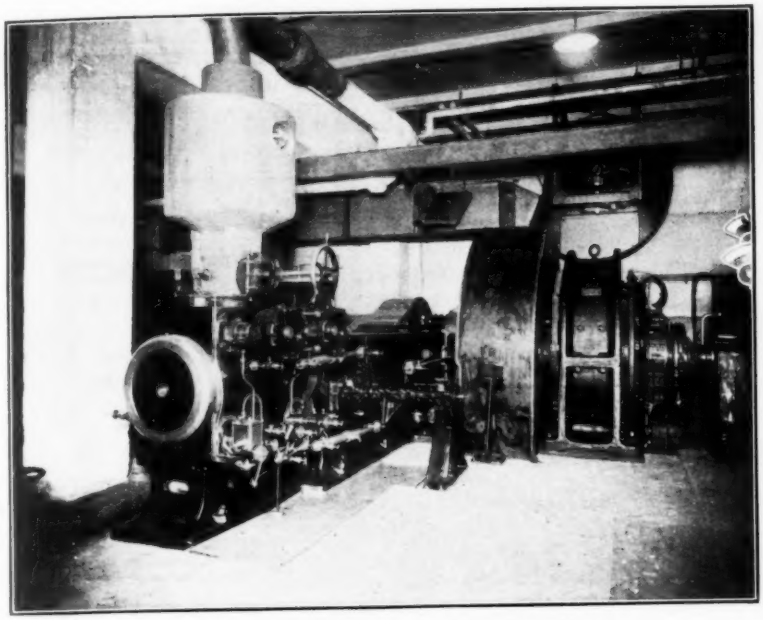


Fig. 4.—One of the Large Three-Wire Generators.

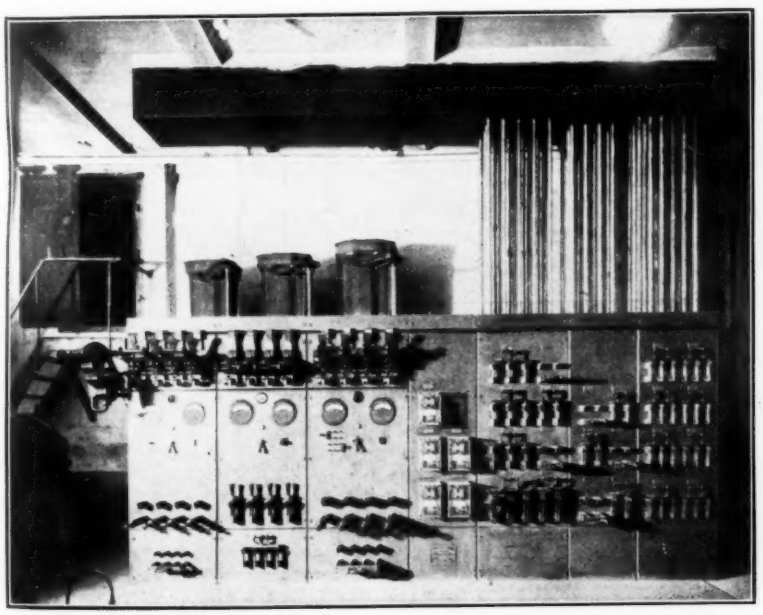


Fig. 5.—View of Switchboard, Feeder Pull-Box and Balancing Transformers.

In the plant referred to in the notes that follow three-wire generators are used. This is the plant in the basement of the Webster Building in Chicago, from which electric current for light and power is supplied to the following buildings situated in the block in which the Webster Building is located:

The eight-story Commerce Building.
The eight-story Trader Building.
The four-story Imperial Building.
The six-story Victoria Hotel.
The eight-story Kaiserhof Hotel.
The Kaiserhof Annex.
The six-story Jenks Building.
The 12-story La Salle Building.

The Webster Building.

The three-wire generators, of which there are three large units in the plant, aggregating 650 kilowatts in rated capacity, were supplied by the Triumph Electric Company. They were designed for 115 volts between neutral and outside wires, or 230 volts across the outside legs of the circuit. One of the machines operates at a speed of 150 revolutions per minute; another at 170; and the third at 225. They were built to carry a 50-per-cent overload for three hours without undue heating, and an overload of 25 per cent continuously. In the acceptance test run by the consulting engineer when the plant was completed 100-per-cent unbalanced load was carried with entire satisfaction to the owners.

Fig. 4 shows one of the large units and the Fleming-Harrisburg high-speed Corliss engine to which it is directly connected. All three of the units are thus driven.

Connections to Switchboard.

Fig. 6 is a diagram which shows rather clearly how the generators are connected to the switchboard in the plant under consideration. Before proceeding with a discussion of this diagram it is well to note that a three-wire direct-current dynamo is essentially a double-current machine—at least, one of the type in this plant could be considered such. As is shown in both Figs. 4 and 6, the armature is equipped with collector rings from which alternating current is taken, in addition to a commutator of standard design. It will be noted that there are three of these collector rings. Taps are carried from them to the armature winding in a manner similar to the connections employed between the armature winding and the slip rings on a three-wire three-phase alternator of the rotating-armature class.

From the brushes which rest on the three slip rings mentioned leads are carried to a balancing transformer, or choke coil. The three balancing transformers are shown at the top of the switchboard in Fig. 5. There is one for each of the three generators. The balancing transformer consists of three coils connected in star or delta, and the neutral wire of the three-wire distributing system is brought out from the neutral point of this connection in the transformer case. The inductive effect of this choke coil prevents alternating current from flowing out into the distributing system, but in case the load on the system becomes unbalanced direct current flows through the balancing transformer so as to take care of the load properly.

Where dynamos of this type are to be run in parallel it is necessary that

the field be provided with two series coils, and that two equalizer wires be connected to each one of the machines. The proper arrangement is made clear in Fig. 6. In this figure the commutator is shown at the left-hand end of the generator, and the bottom brush is supposed to be the positive one. Under normal conditions the path of the current is from this brush, up through the circuit-breaker, back through one of the series windings, and to the positive busbar of the switchboard. From a balanced load the current flows to the negative busbar, then through the other half of the series field of the generator, through the circuit-breaker, and to the negative brush of the dynamo.

The equalizer busbars are marked

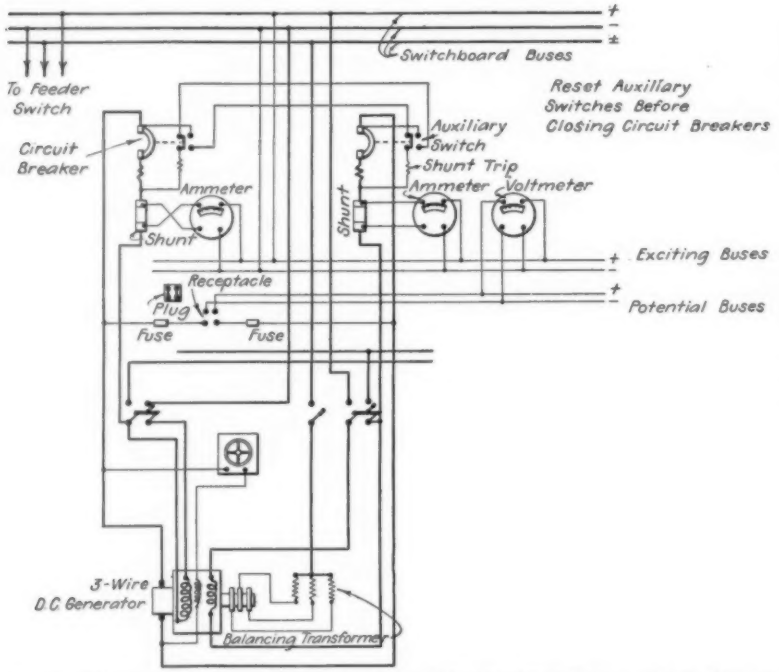


Fig. 6.—Diagram of Wiring from Generator to Balancing Transformer and Busbars on Switchboard.

with two short horizontal lines in Fig. 6; it will be noted that the equalizer wires are connected between the generator brush and the series winding. When it happens that one of the generators begins to carry more than its share of the total load, additional current flows into the series windings of the other machines from the equalizer busbars, raises their voltages, and thus causes a readjustment of the load.

The Switchboard.

Reference has already been made to the switchboard in the Webster Building plant. It consists of seven panels. The first three on the left-hand end, as the observer faces the board, are generator panels. These are equipped with knife switches, I. T. E. circuit-breakers and flush-type ammeters and voltmeters. The next panel is the meter panel, Duncan watt-hour meters for recording the output of the plant being installed on this. The remaining three panels are feeder panels, and these accommodate the knife switches that control the feeder circuits.

Since the block that the plant in question serves is in the downtown district of Chicago, the distribution lines are all under ground. The feeder circuits connect with the switchboard through a pull-box made of sheet steel, reinforced with an angle-iron framework and installed on the ceiling above the switchboard. The feeders are carried from the busbars up to the pull-box in conduits, which enter the pull-box through knockout openings and are fastened in place at the upper ends with standard locknuts and bushings. The arrangement is shown very clearly in Fig. 5.

The plant in the Webster Building was designed by M. C. Hartman, consulting engineer, of Chicago, and J. G. Harris is the chief engineer of the plant. Acknowledgments are due them for their courtesy in making available the foregoing data.

Solder for Aluminum.

A patent has been issued by the United States Government, to Charles Willmott, of Smithwick, England, for an aluminum solder. The solder is composed of a mixture of tin and bismuth in the proportion of about 86 to 14 per cent.

A Cabinet for Meter and Cutouts.

Not long ago I was called upon to do some electrical work in a bungalow where the conditions were such that the meter had to be located in a part

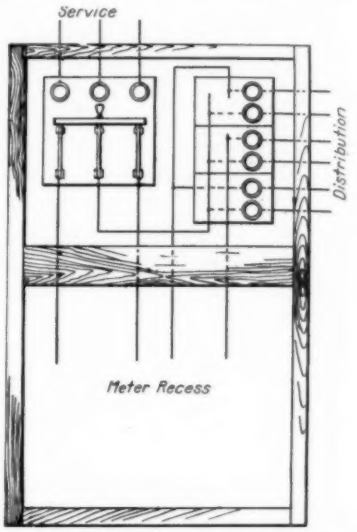


Fig. 1.—Arrangement of Cutouts and Meter Recess.

of the building where the appearance of the usual sort of meter installation would have been objectionable. It happened, too, that the point where the meter was to be installed was to be the distributing center for the branch circuits to the various parts of the house. I was able to make the job entirely satisfactory to the architects and the owners by building a special

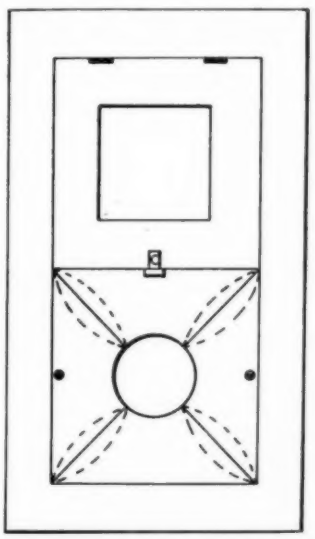


Fig. 2.—Front View of Completed Cabinet with Door Closed.

cabinet of the type shown in the accompanying figures. It will be noted that a recess for the meter was provided in the bottom of the cutout cabinet.

In order that the meter may be certain to fit, the meter recess in a cabinet of this kind should not be smaller than 12 by 14 inches, and the backing should be set in so as to get as much space between the millwork trim as possible. The panel door and the casing frame for the entire opening may be made in the customary way, but the meter-frame cover should consist of four pieces of lumber cut in triangular shape, with the grain running paralled with the long side. These pieces should be slotted along the short edge to take inserts of the same grade of lumber, and they should be glued together—never nailed, if a first-class job is wanted. The dotted lines in Fig. 2 indicate the method of fastening the pieces together.

After it has been ascertained what design of meter is to be installed, the front of the meter recess can be cut out to fit the meter outline. A round hole will probably be best in most cases, however. If a meter having a round front is used, about an inch of the meter front should project from the recess. In the hanging of the panel door the hinge should be countersunk into the door, rather than into the framework, and the door should be arranged so that gravity will close it. The meter frame can be fastened into the rabbet formed around the edge of the cabinet by making the casing frame with an opening an inch larger than the cabinet opening and putting in two round-headed finished screws at the sides of the meter frame. The casing frame should be fastened with six screws of the type just mentioned, three on either side.

In an installation of the type illustrated in Figs. 1 and 2 the cabinet proper would be 12 by 12 inches, and from 3 to 5 inches deep, according to the depth of the partition or wall where it was to be placed. The meter recess would be of the same depth and the other two dimensions would be 12 inches and 14 inches. Thus the entire opening between ground strips would be 22 by 26 inches in size. The casing-frame opening would be 13 by 27 inches, the panel door 13 by 12 inches, and the meter frame 13 by 15 inches.

Russell H. Eddy.

Electric Alarm for Oil Pump.

At the turbo-electric plant where I am employed we burn oil as fuel. The oil is delivered to us by means of a 4-inch pipe line which passes under a navigable river and is about 2,000 feet in length. At our station we have a 50,000-gallon storage tank, into the top of which the pipe line leads. This supply tank is located some distance from the fire room, on account of fire risk. The oil company used to notify us when they began to pump and when they stopped, by telephone, but the fireman could not tell whether the oil was actually flowing into our tank or not. As a consequence, the pipe line breaking one day, the oil company pumped our oil out on the marsh for about four hours, causing us a heavy loss. It was put up to me to put an alarm on the pipe line that would ring when they started to pump and again when the oil stopped flowing. The accompanying sketch shows how I arranged it. The bell, batteries and double-throw single-pole switch were set in the fireroom and when oil flows into the tank the cup is forced down, raising the brass rod to top contact; this rings the bell. The fireman, on hearing the alarm, changes the double-throw switch to the lower position. The alarm is then ready to ring if the oil stops flowing, whether from a break in the line or the stopping of the pump at the oil company's works. When the alarm sounds "no oil" the fireman replaces the switch in the upper position and the oil company is notified. We have used this for several years and it has never failed us yet.

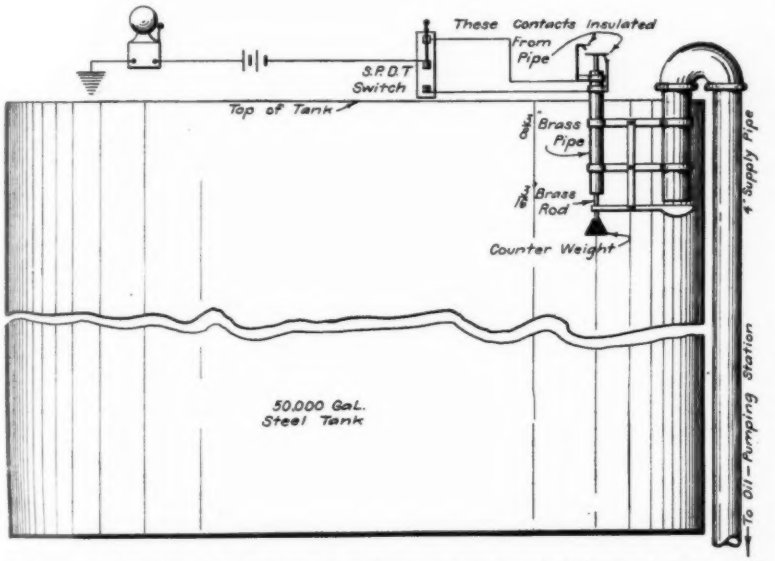


Diagram of Connections to Bell which Indicates Starting and Stopping of Flow of Oil.

James McMahon.

Rewinding Coils of Arc Lamps.

When the shunt coils of alternating-current series-inclosed arc lamps burn out, and have to be rewound in the shop of the local electrician, it is a good plan for him to use wire in the rewinding which is the next size smaller than the wire with which the coil was originally wound, I find. Thus a longer wire than was originally used can be put on the spool, and the electrician can be certain of getting sufficient resistance in the rewound coil. If he undertakes to wind the coil with the same size of wire that was used in the new lamp, he is very liable to find himself unable to get enough of it on, because he lacks the facilities for winding that are found in the factory where the lamp was made.

These coils are shunted across the arc when the lamp is put in service, and it is my experience that an increase in the resistance is not objectionable; in fact, it is rather to be preferred, for it makes it possible to draw a better arc. Moreover, the balance weight can then be placed at the cutout end of the arm, thus insuring that the lamp will cut out properly. When the resistance is insufficient, on the other hand, the balance weight has to be placed on the opposite side from the cutout in order to get a good light. The lamp then does not cut out nearly so promptly, and the liability of the coil being burned out again is greatly increased.

Harold M. Speck.

Treatment of Foundry Sand.

A recently patented process for the treatment or renovation of foundry sand consists in adding to the sand equal parts by weight of sulphate of aluminum, sulphate of magnesium and water. The inventor of this process is Andrew Poulson, of Farnworth, Widnes, England.

It is announced that the secretary of the National Electrical Contracters' Association will soon be ready to distribute revised copies of the standard conduit charts which the Association prepared about a year and a half ago. The charts have been thoroughly revised.

Guide to Changes in National Electrical Code.

The Philadelphia Fire Underwriters' Association has issued, in small pamphlet form, a guide to changes made in the National Electrical Code in the latest revision. Without attempting to show just what the changes are, the pamphlet calls attention to each rule and section that was modified, and thus makes it rather easy for the reader to look up the differences between the 1911 and the 1913 editions of the Code.

Texas Contractors Meet.

The state convention of the Electrical Contractors' Association of Texas was held at Waco on November 13, and was attended by delegates from the cities of Dallas, Greenville, San Antonio, Fort Worth, Houston and Waco. In the absence of President Martin Wright, of San Antonio, Vice-president Jack Owens, of Waco, presided. The following officers were elected: A. J. Anderson, Fort Worth, president; W. H. Earle, Dallas, vice-president; George Bounds, Fort Worth, treasurer; C. M. Cockrell, Dallas, secretary; William Clower, Dallas, delegate to National Association convention at Detroit in July, 1914; alternate, E. T. Bordeu, Houston.

Fort Worth was selected as the place of the next convention in April, 1914.

Licenses for Wiremen in New Zealand.

It is announced that the Wellington (New Zealand) Council has adopted a law providing that no person shall undertake electrical work in that city except such men as have secures a license either as a journeyman wireman or as a master electrician.

Ruling on the Service Requirements of the New York Electrical Code.

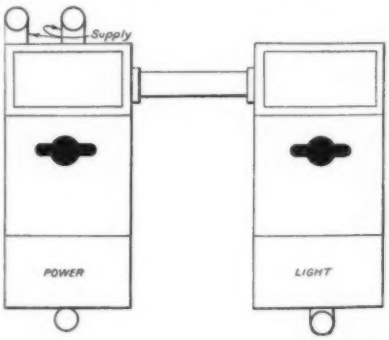
As the result of conferences on evidence secured in the investigation of a number of electrical fires, Commissioner Henry S. Thompson, of the Department of Water Supply, Gas and Electricity of the City of New York, has made the following ruling, upon request of the conference, which represented the electrical inspection services of the underwriters, the electric light companies and the city.

It is understood that this interpretation involves no change in the electrical code and shall not be retroactive except in cases where dangerous conditions appear to exist.

(1) Service conduits or metallic coverings protecting service wires must be electrically separated from the conduit system in the building.

This metallic pathway may be broken by the porcelain service switch or by insulating material, such as fiber or transite board, so installed as to provide a separation and insulation between the incoming service conduits or metallic coverings and the interior electric system.

It is suggested that a connection be-

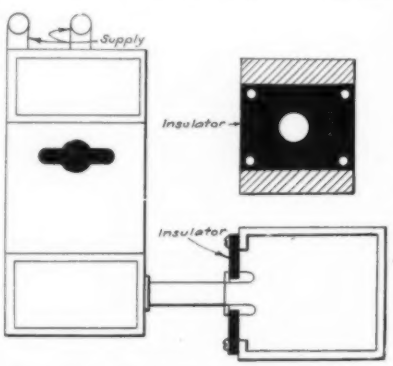


A Service Arrangement that is Suggested.

tween the service conduit or metallic covering and the neutral wire of a grounded system on the street side of service switch be permitted if desired, and it was requested that, if adopted, the above would not be made retroactive but would apply to future installations only.

(2) New-code conduit wire may be used for service connections, provided the service conduit does not enter the building more than six feet. In case the conduit is concealed or is extended beyond the six-foot limit, it is recommended that the wire used in same be provided with an additional one-sixty-fourth inch of rubber or be protected by an additional one-thirty-second-inch braid over each conductor or multiple conductors.

(3) All wires entering a building and constituting source of supply shall be carried through approved service



A Method of Interrupting Continuity of Metallic Raceway for Wires.

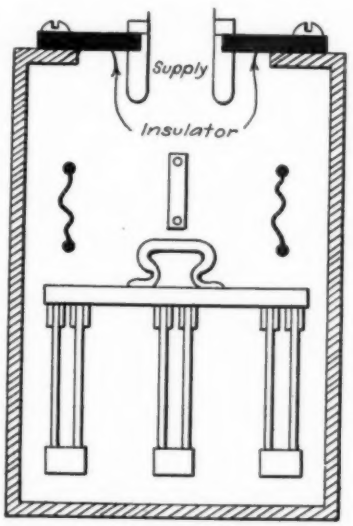
devices. This will permit of all wires entering building being controlled either by one device having the requisite number of connections or by two or more approved devices so installed that when any one is operated the entire installation depending upon that circuit will be entirely disconnected.

(4) Fuse protection must be provided as called for in the rules of the National Electrical Code and the Electrical Code of the City of New York at a point where connection is made between all branches and main feeders, or as near thereto as possible. A neutral fuse will not be required at this point, provided the circuits are fused on house side of meter, as called for in the Code.

(5) Where two-wire meters are installed on three-wire circuits, and the neutral system is grounded, the loop connecting the two outer wires must be on the meter side of the three-pole cutout protecting the three-wire branch circuit.

In case the neutral is not grounded, a three-wire meter must be installed in order that all three wires of the final branch circuit will be protected by proper fuses.

In cases where the final branch cir-



An Approved Method of Installing Service Switch.

cuit is properly protected by the cutout in the meter case, no additional cutout on the house side of the meter will be required.

The accompanying diagrams are intended to illustrate some service conditions which were investigated.

Among the Contractors.

Fred A. Clegg, of F. A. Clegg and Company, electrical contractors and engineers of Louisville, Ky., has undergone an operation for appendicitis at St. Josephs Infirmary in Louisville. The operation was successful and Mr. Clegg's speedy recovery is now looked forward

to. He recently returned from French Lick Springs, Ind., where he had been for treatment.

Cates and Shepherd, of Philadelphia, Pa., are installing the electrical work in the new addition to the Curtis Publishing Company's plant.

The Thompson Electric Company, of Muncie, Ind., has recently been bought by Merrill R. Clark and J. Bud Wise, of Muncie. The firm name will be retained and the company will continue a general electrical contracting business. Messrs. Clark and Wise are aggressive, wide-awake men, and the business should prosper under their direction.

The contract for the electrical work in the new high-school building at Moline, Ill., has been awarded to the Tri-City Electric Company, of Moline.

The Wadsworth Chocolate Company, Newark, N. J., has awarded a contract for the erection of a new power and heating plant at its factory on Jelliff Avenue, now in course of construction, to William H. McKiever, at a cost of $6,500.

The Strang Electric Company, of Philadelphia, is putting in the electrical equipment in the United States post office and court house at Marquette, Mich., the installation being practically completed now.

The Camden Electric Construction Company, electrical contractors and engineers of Camden, N. J., is now comprised of C. R. Gaunt and William Hunter. Mr. Hunter, who has recently entered the firm, has charge of the office business while Mr. Gaunt continues to supervise the company's construction work, etc.

Among the recent electrical installations made in Philadelphia by M. E. Arnold and Company, of that city, was the lighting equipment in the new nine-story loft building of J. Edwards and Company and the complete electrical equipment in the new building of Showell-Fryer and Company. The latter consisted of both lighting and power installation and included motors for coffee-roasting, bottle-washing, elevators and cash-carrier system. A private intercommunicating telephone system was also installed.

The National Electric Company nas been awarded a contract for the electrical installation in the new seven-story building for Heywood Brothers & Wakefield Company. This installation will be wired in conduit throughout. The same firm has the wiring and fixtures for the new five-story addition to the store of J. Weisenfield & Company. This installation calls for galvanized conduit and slate panels.

W. D. Gale, who conducts an electrical contracting business in Detroit, Mich., with headquarters at 295 Gratiot Avenue, has added an electric-fixture department to his former line of work. This department will be kept thorough and modern in every way.

The Grossman Electric Company, of 1532 South Fourth Street, Philadelphia, is just completing the electrical installation in the new six-story loft building at 28 and 30 North Sixth Street, Philadelphia.

A. J. Burns.

The industrial world is usually somewhat reluctant about following the lead of the theorist. But the man with sound ideas grown out of his own experience and his own personal observation of actual conditions has a road to prominence and influence among his associates that ought never be a difficult one. A. J. Burns, of Kansas City, Mo., is a man of this type; and, while his is not the largest electrical contracting business in his city, he is to the contracting interests one of the most useful of men.

A. J. Burns,
Secretary Missouri Electrical Contractors' Association.

Mr. Burns is a native of Ohio, Cleveland being the city of his birth. At an early age he became an apprentice machinist, with the Lake Shore Railroad, in Cleveland, but as soon as he had completed his apprenticeship he went on the road as a locomotive engineer. Later on he worked for a time as a marine engineer, and upon quitting this service he became an engineer for the Grand Trunk Railway in Canada. Here he became acquainted with Thomas A. Edison, who was then a telegraph operator for the road last mentioned. About this time Mr. Burns' uncle, who was a member of the firm of Stevens, Turner & Burns, of London, Ont., secured the Canadian rights to manufacture the Ball arc-lighting machine, and A. J. Burns was selected to take charge of the shop work in this manufacturing enterprise. Soon thereafter, having made up his mind to seek a larger field for electrical work, Mr. Burns went to New York City, where through his former acquaintance with Mr. Edison he secured immediate employment with the Edison interests, and, in due time, acquired familiarity with the construction end of electrical work, as construction was done in those times. He has been engaged in electrical work continuously ever since. While in the employ of the Edison interests he did work in Alaska and in nearly every state and territory in the Union.

Mr. Burns entered the electrical construction field in Kansas City in 1891. For awhile he served this city as city electrician. He is the secretary of the Missouri State Association of Electrical Contractors, and of the Kansas City local association, and is prominent in the contracting industry in other important ways. He is a man who is held in highest esteem by a large circle of friends and business associates.

Electric Drills.

A description of three types of electric drills, with the results of tests carried out during the construction of the new Catskill aqueduct and tunnels for the water suply of New York City is given in the *Sibley Journal of Engineering* for October.

Electric drills are found to give a saving in cost of both initial installation and power consumed over pneumatic drills, although they were found to cut more slowly. The net saving effected is dependent largely upon the size of the tunnel; thus in drilling for a two-track railroad tunnel the unit costs would not be more than 50 per cent of the cost on a single-track or aqueduct tunnel.

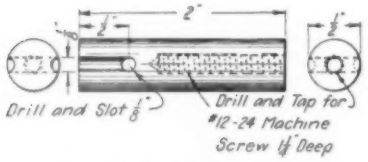
The comparison of power shows that on the average one 3.25-inch air drill will consume about 25 horsepower. On the other hand, an electric drill of equal capacity will require while in operation, not more than 4 horsepower, and assuming that it is in actual operation not more than 60 per cent of the shift, would mean that the actual power consumed would average 2.4 horsepower. It will be seen, therefore, that where it becomes necessary to use electric current for the compression of air, which is necessarily very much more expensive than generation by steam under ordinary circumstances, the difference in energy consumption is of very great importance economically.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

A Method of Keeping Potential Busbars Taut.

It is usually impracticable to run the wires for making taps to control switches, potential or synchronizing receptacles, etc., directly on the back of the panels in switchboard work; there are too many busbars, studs and angle-iron supports in the way. The only alternatives are either to run them in pipes and use the proper fittings to bring out the taps, or else to install all the control wiring as open work. The latter scheme has the advantage that the circuits can be readily traced out when a search has



Dimensions of Turnbuckle.

to be made for any trouble that may have occurred. Where the work is run open it is customary to support these bus wires by means of two-wire or three-wire cleats, using as many of them, placed end to end, as the number of busses makes necessary. These cleats are supported either on pipe-fitting supports, against vertical pipe stanchions of the switchboard, or directly against the angle-iron supports of the board with machine screws. I have found that a turnbuckle in the ends of the bus wires serves a good purpose, and I use the one illustrated above.

The turnbuckles take up the slack in the wire when the work is being installed, and at any subsequent time. They can be put directly in the porcelain cleats, fastened down loosely with machine screws, or held by a light piece of angle-iron fastened to the framework of the switchboard.

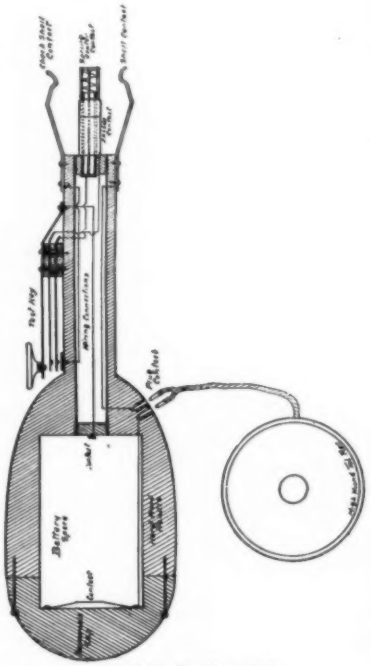
The turnbuckle is made of half-inch round fiber rod, drilled, tapped and slotted as shown in the figure, and a machine screw an inch and a half or two inches long, with a round head, is employed for taking up the slack in the wires, which are usually No. 10 or No. 12 B. & S. gauge size. The wire is bared for about two inches at the end and twisted in the slotted hole, after which the bared portion can be taped or painted with an insulating paint.

H. W. Parsons.

A Simple Device for Testing Inside Wiring.

The Kink by John Shortt in the issue of November 8, describing a method of testing inside electric wiring for short-circuits and grounds, leads me to call attention to a device that I designed some years ago, and used while I was serving as an electrical inspector. The instrument is shown below.

This instrument, while designed primarily for fixture work, may be



Complete Testing Set.

used on a conduit installation with excellent results by attaching leads to the contacts.

As the key is pressed down three distinct tests are made, viz.: Line No. 1 to ground; line No. 2 to ground; one ground to another as a check to determine if thorough contact is being made and if the instrument is in proper working order. It should be noted that the clips at the top of the device are arranged to fit in and over the lamp socket when a fixture is under test. The telephone receiver is plugged into the base of the instrument.

D. R. Shearer.

A Box for Porcelain Tubes and Knobs.

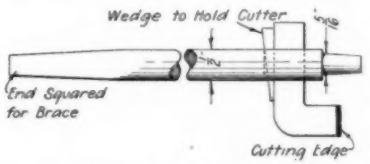
Keepers of stores which deal in electric-wiring supplies spend a great deal of time, some of them, digging porcelain knobs and tubes out of the sawdust in which they are shipped, or in pouring them back and forth in a strong wind trying to get rid of the sawdust. In order to avoid such a procedure as this, I use a special type of seive for sifting the sawdust out. I made it by taking a light box, reinforcing the corners, fastening a piece of large-mesh woven wire over the top of it, and removing the bottom. With this appliance it is easy to sift out the sawdust.

S. M. Brockway.

Tool for Switchboard Drilling.

In the course of a job which I was doing some time ago, I had occasion to drill a hole in a marble switchboard panel for a three-inch stud. As there was no drill large enough to do the job, I had a tool made similar to the one shown herewith. This tool I used in a brace, first drilling a five-sixteenth guide hole.

It will be observed that the tool will cut a channel around the edge of the hole. When this channel has been



Tool for Cutting Large Holes in Switchboard.

cut down as far as the shoulder will allow, the material between the channel and guide hole can be easily and quickly chipped out, after which the operation can be repeated until the hole is completed.

The cutter can be easily adjusted for any size of hole desired, and it makes a neat hole, without scaling away any of the surface around the edge.

W. R. Smith.

A New Soldering Stick.

A patent was recently issued to Ludwig Maes, of Bonn, Germany, for a soldering stick consisting of a casing of soft solder and a filler of paste-like material which contains metallic soft solder in a finely divided state. The filling and the casing combine to close up the end of the stick whenever the soldering heat has been removed. The paste filling contains sal ammoniac and glycerine, in addition to the finely divided solder. The United States patent was issued under date of November 18.

Public Service Commissions

CALIFORNIA.

The Railroad Commission has rendered a decision granting authority to the Coast Valleys Gas & Electric Company to issue $114,000 of bonds.

The San Diego Consolidated Gas & Electric Company was granted authority to issue $41,000 of bonds under a previous order of the Commission.

The Commission has declared all the long-distance telephone rates maintained by the Pacific Telephone & Telegraph Company in California excessive, and has substituted a new and reduced schedule. The Commission's decision follows an investigation extending over a period of nearly two years, during which 64,000 messages were investigated by the Commission experts. The new rates go into effect on February 16, 1914. An average cut of 21 per cent is made in long-distance rates, in some instances the reduction being as much as 70 per cent. The Commission finds that the present rates would yield the company over 14 per cent profit, and cuts this down to approximately 9 per cent. The Commission fixes the rate at 0.5 cent per air-line mile for two-minute conversation, with 50-per-cent increase for every additional minute or fraction thereof. It requires 30-per-cent of long-distance revenue to be credited to city exchanges whereas the company heretofore allowed 15 per cent. The decision divides the state into blocks and sections for rate purposes, following postal-rate zones.

MASSACHUSETTS.

Andrew A. Highlands, of Brookline, has been appointed secretary of the Massachusetts Public Service Commission.

Charles E. Mann, who has been clerk of the Railroad Commission, and since its change to the Public Service Commission, the acting secretary of the latter body becomes executive secretary, with the custody of the Commission's records and documents; and Allan Brooks retains his position as assistant secretary. C. Peter Clark is appointed chief of the rate and tariff bureau of the Commission. The new organization has already been effected.

The Massachusetts Gas and Electric Light Commissioners have approved the issue of 750 shares of new capital stock, at $100 per share, by the Amherst Gas Company, which distributes electricity in that town. The purpose of the issue is to pay outstanding notes represented by additions to the company's gas and electric plants. Between December 31, 1913 and October 1, 1913 about $75,000 was expended for this purpose.

The Massachusetts Gas and Electric Light Commissioners have approved the issue, by the Malden Electric Company, one of the Tenny properties, of 3,360 shares of new capital stock, par value $100, at $145 a share. The proceeds of 1,380 shares are to be applied to the payment of notes outstanding March 31, 1913, and of 1,550 shares to defray cost of underground construction made after that date, and of 430 shares toward the payment of cost of other additions to plant. The company asked for approval of an issue of 3,931 shares, for the payment of floating indebtedness, new construction, extensions and further additions. The Commission, in rendering its decision approving the issue of 3,360 shares, says that the approval of so much of the new stock included in the petition as it is proposed to issue on account of ordinary minor additions during the next three years, incident to the prospective increase in the number of customers, may be deferred until the amount of the expenditure therefor can be more clearly shown.

The Commission has approved the issue of 1,500 shares of new stock by the Amesbury Electric Light Company. The price of issue is par value, $100 per share. The proceeds of 200 shares are to be applied to the payment of notes of June 30, 1913; of 700 shares to the cancellation of the company's entire bonded indebtedness, and of 600 shares to the payment of cost of additions to its generating equipment made after June 30, 1913.

On June 3, 1913, the Massachusetts Public Service Commission ordered the installation of an interlocking signal system by the Boston & Main Railroad Company, in place of ball signals, at South Lawrence, and recommended the replacing of all ball signals in the State by improved signaling systems. The Boston & Maine company petitioned for a suspension of the order, but the Commission declined to recede from its position.

NEW JERSEY.

The Board of Public Utility Commissioners has approved of an ordinance granting a franchise to the Farmingdale Lighting Company to construct electric light and power lines in the Borough of Farmingdale.

The Board has dismissed the complaint of the Postal Telegraph Cable Company demanding that the New York Telephone Company accord to it certain reductions in tolls on telegrams delivered over such company's lines, alleging that it had been refused these reductions, which, it charged, had been granted to the Western Union Telegraph Company. In the testimony it was adduced that while the Postal Company only sought reduced tolls in the telephoning of telegrams by the company to its customers, the contract between the telephone company and the Western Union Company provides for such reductions to both inward and outbound messages; the telephone company expressed its willingness to enter into a similar contract with the Postal Company identical with that in force with the Western Union, but it refused to divide the contract by making it applicable only to the delivery of messages. In its decision the Board, while admitting that the community of financial interests between the telephone company and the Western Union through their joint relationship with the American Telegraph & Telephone Company, warrants careful consideration, finds no merit in the Postal Company's complaint, and says:

"The contract in question provides for the reduced rates only in case the telegraph company accepts the contract in its entirety. It does not permit the telegraph company to obtain the reduced toll rates on inward telegrams only, or on telegrams for delivery only; but obligates the telegraph company to pay the telephone tolls on both. The specific demand of the Postal, asking for reduced tolls on calls designated to deliver telegrams over the telephone, without assumption on the Postal's part of any of the contractual burdens in consideration of which the reduced toll rates are accorded in the contract offered alike to all commercial telegraph companies, would appear to us to involve an undue and unjust discrimination, both as

against the Western Union and as against the public generally. The Western Union obtains the special rates by assuming special obligations. The public assuming no special obligation, pays the regular toll rates. The Postal, offering no counter equivalent to justify special rates, asks for what is practically a system of rebates. It is evident that the volume of inward service is likely to be larger and, therefore, more remunerative to the telephone company than the delivery service. It would seem to follow that the acceptance by a telegraph company of only that part of the telegram toll plan which is the least advantageous to the telephone company would not fairly warrant giving the telegraph company the same reduced toll rates which other companies obtain under the contract only by assuring to the telephone company the benefits resulting from both outward and inward service."

NEW YORK.

The Public Service Commission for the First District has approved the issue of a mortgage of $30,000,000 by the New York Connecting Railroad Company and the present issue of bonds to the extent of $11,000,000 under that mortgage. The bonds are to run 50 years and to bear 4.5-per-cent interest per annum. They are to be sold at not less than 91 per cent of par value, and the discount is to be amortized during the life of the bonds. The proceeds will be devoted to the payment of construction expenses, including the refunding of short-term notes made for the purpose of raising money to defray the cost of work already done.

The New York Connecting Railroad Company is owned jointly by the Pennsylvania and New Haven Companies, and is engaged in building a railroad and bridge to connect the New Haven system with the Long Island Railroad and other Pennsylvania lines.

The Public Service Commission for the First District has reaffirmed a previous order requiring the surface car companies of the Brooklyn Rapid Transit to equip their cars with wheel-guards and fenders. The companies had already accepted the order as to wheel-guards, but objected to that part of the order requiring the installation of new projecting fenders on the ground that the cars are now equipped with a type of projecting fender, and it would be a useless expense to remove these and substitute others. The Commission, however, disapproved the type of fender now in use, and after rehearing reaffirmed the previous order requiring the new installation to be carried out.

WISCONSIN.

In the matter of the compensation to be paid by the city of Manitowoc for the property of the Manitowoc Electric Company, the Railroad Commission has determined that the sum of $137,500 is a reasonable price and has ordered the city to pay this sum within three months. The engineering staff put a present value of $132,770 upon the plant and placed the cost of reproduction at $173,708. The above authorization was made in accordance with the provisions of the indeterminate permit law, passed by the legislature in 1907, which permits a municipality to take over an existing utility operating under an indeterminate permit at any time at a valuation determined upon by the Railroad Commission. Under this law practically all of the water plants of the state have become municipal enterprises. The cities that have purchased plants since the law was enacted are:

Cashton (electric)	$ 3,100
Appleton (water)	255,000
Lake Geneva (water)	86,500
Manitowoc (electric)	137,500
Manitowoc (water)	236,000
Brodhead (electric)	40,000
Antigo (water)	128,800
Fond du Lac (water)	320,000
Sheboygan (water)	415,000
Kaukana (electric)	50,000
Whitewater (water)	75,000
Oshkosh (water)	525,000
Beaver Dam (water)	123,000

The Wausau Gas Company has been authorized to issue $28,000 in five-per-cent bonds to reimburse the company for capital expenditures made for extensions and improvements during the last three years.

The application of the Clinton Telephone Company for authority to extend its lines has been denied by the Commission on the ground that the proposed extension would bring the applicant into competition with the Bergen Telephone Company, now serving the territory in question. The proposed extension was designed to serve but one subscriber, an old subscriber of the applicant who had moved out of its territory, but the Commission held that the law must be rigorously enforced to prevent future requests of the same nature.

Upon application of the city of Portage, the Commission has investigated the affairs of the Portage American Gas Company and has prescribed a schedule of charges which will effect a reduction in revenues of about 14 per cent.

The Commission has handed down its decision on the application of the Neshkoro Light and Power Company for an increase in rates. From the company's accounts it appeared that an increase in rates was necessary, but a reapportionment of the accounts according to the proper accounting methods showed that the utility was earning in the neighborhood of 15 per cent upon the investment. The schedule prescribed by the Commission on the basis of the above showing, will result in a decrease in rates. The old primary rate was ten cents for the first 100 kilowatt-hours. The schedule ordered is as follows: primary rate, 9 cents net for the first 60 hours' use per month of the active connected load; secondary rate, 7 cents net for the next 40 hours' use per month of the active connected load; excess rate, 4 cents net. In class A, consisting of residences, 60 per cent of the first 500 watts connected and 33.3 per cent of the excess is to be deemed active. In class B, consisting of banks, offices, business and professional establishments, etc., 70 per cent of the first 2.5 kilowatts connected and 55 per cent of the balance is to be considered active. In class C, consisting of public buildings, churches, schools, hotels, etc., 55 per cent is to be active. The minimum bill is to be $1.00 per month.

The rates for power will consist of a charge of $1.25 net per active horsepower capacity per month, plus a charge of 4 cents per kilowatt-hour for energy used. The active load is to consist of 90 per cent of the first 10 horsepower, 75 per cent of the next 20 horsepower, 60 per cent of the next 30 horsepower, and 50 per cent of the balance. The minimum bill is to be $2.50 per month.

Transatlantic Telephony.

It was announced by William Marconi on November 18 that vocal sounds, but not actual words, have been transmitted by wireless telephone across the Atlantic from Clifden, Ireland, to Glace Bay, Nova Scotia. Mr. Marconi declared that no conversation was held in the experiments made by him.

Rear Admiral Emsmann is credited with a statement, made in Berlin, Germany, on November 21, that telephone communication had been made between Neustadt, Hanover, and a station in New Jersey, a distance of nearly 4,000 miles.

City Engineer Wanted.

A qualified engineer is to be appointed by the city of Owensboro, Ky., to take charge of the municipal electric light and water plants. The official will also have the title of city clerk, this office having been combined with the others. The mayor of Owensboro believes that by putting all of the offices together much greater efficiency will be secured.

Among the Supply Men

ELECTRICAL SUPPLY JOBBERS HOLD BIG MEETING AT HOT SPRINGS, VA.

Lively Session and Good Outdoor Sports.

The quarterly meeting of the Electrical Supply Jobbers' Association of the United States was held at Hot Springs, Va., at the Homestead Hotel, on Tuesday, Wednesday and Thursday, November 18, 19 and 20. Of the three hundred-odd electrical men in attendance, about 115 were electrical supply jobbers, the balance being made up of representatives of the leading manufacturers of electrical products of this country. The weather was ideal and a holiday spirit seemed as usual to pervade the animated groups which formed about the lobby and verandas discussing the questions which are of most importance to the distributer and manufacturer alike. Golf enthusiasts to the number of probably 50 or 60 had arrived all the way from the Friday evening previous up until the time of beginning the sessions. In both the manufacturers' and jobbers' tournaments big fields started for the golf and other outdoor sports, while only a corporal's guard could be mustered to participate in the pool and billiard tournaments. There was a very fair attendance of ladies, a great many of whom participated in the golf games and more of whom took great interest in the bridge and whist tournament.

The formal meetings of the Electrical Supply Jobbers' Association were enlivened by many interesting discussions, the subject of the handling of fan motors and small material coming in for a particularly thorough overhauling. By way of interest and diversion, the jobbers listened to the presentation of several matters just a little removed from their immediate and ordinary considerations. These consisted primarily of a "Discussion of a Classification of Accounts and an Analytic System of Bookkeeping," by Norman E. Webster, of Niles & Niles, certified public accountants of New York City; an address on "Discounts and System of Accounts," by Fred P. Vose, of Chicago; an address on "Efficiency in the Handling of Merchandising Details," by H. R. Brand, of New York City, and a discussion of the "Electrical Supply Jobber as an Economic Factor in the Distribution of Supplies," by A. A. Gray, managing editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, Chicago.

Analyzing the Accounts of the Jobbers.

Mr. Webster considers that there should be a classification and grouping of expense such as would assist the jobber in determining the cost of doing portions of the business as separated from other portions. The analysis of costs in such a classification of sales would show the profitable and unprofitable business not only on a basis of the percentage of gross profit, but also on a basis of the percentage of net profit after deducting the expenses applicable to particular lines or classes of sales. In order that the widest use might be made of such a system there should be a uniform standard classification which would be used and recognized and understood by all jobbers. As a result of dividing the accounts into several grand divisions, sub-dividing these grand divisions into such other divisions as the particular business might determine, the jobber could learn wherein he conducted his business more or less efficiently than someone else. By thus standardizing and harmonizing the methods of arriving at the cost of doing business better methods could be introduced into the systems of those who were not conducting their business in a way that would bring about the greatest advantage to all. The accounting system, however, should be one adapted to the small as well as the large organization, and furthermore should be one that could be adopted and maintained without too great expense.

Mr. Webster was greeted with considerable applause for the masterly handling of his subject, and upon motion the report was referred to the executive committee for further consideration.

The Jobber as an Economic Factor in the Distribution of Supplies.

Mr. Gray holds that the electrical supply jobber is an economic factor in the distribution of supplies. His elimination or any movement in the direction of curtailing his usefulness would throw a burden upon the industry and increase the cost of current-consuming devices to the ultimate consumer. This would retard the business and keep back the development of the industry. The jobber, however, will continue as an economic factor only as long as his organization renders easy the merchandising of supplies and co-ordinates his selling and service efforts with those of the manufacturer, so that material may pass from the manufacturer to the consumer with the least degree of resistance and at the lowest possible expense in handling. As the demand for electrical material increases, the demand will also increase for high-grade material at a reasonable price. The manufacturer of electrical apparatus has put the greatest amount of skill, ability and courage into the production of his goods, and gotten less in return than the manufacturer devoted to any other industry. The price of electrical goods today is as low as is consistent with the production of standard material and an adequate return for the labor involved. In this situation the supply jobber must so conduct his business that there shall be no additional burden thrust between the consumer and the producer. The business must be conducted upon the most rigid basis of economy and efficiency, and the right price for the material must be secured, through the sales effort of the jobbers as the direct representatives of the manufacturers in the field. The policy of reducing prices on standard goods to overcome local competitive conditions, while it gives to the consumer a temporary advantage, in reality works an ultimate hardship, in that it depletes the resources which are necessary for the maintenance of an organization for efficient and economical handling of the business as a whole.

The Use of the Cash Discount in the Settlement of Accounts.

On Thursday morning Mr. Vose discussed at length the question of the use of the discount in the settlement of accounts. The purchaser is inclined to think that the expression "cash discount" is added to the price of goods as a form of penalty to be suffered if he fails to pay within the

discount period. Therefore, he concludes that he is entitled to deduct two per cent at any time and thus bring the cost to him to the proper figure. Cash discount, however, is the premium offered for the use of ready money. If the seller does not get the use of the money he should no more be charged for it than should the buyer be charged with goods that he does not receive. Every payment after maturity should be accompanied by the legal rate of interest. There is no reason why a prompt-paying customer should be discriminated against. He pays according to the terms and his money helps to carry the slow customer who may be an unfair competitor of the prompt-paying customer. Nothing but weakness on the part of the seller permits the continuance of such unfair practices. Where cash discounts are insisted upon the hazards of business are lessened, and a customer should not be carried without interest from date due even to secure or to retain his business. Some buyers deliberately take unearned cash discounts and some sellers unwillingly extend the period. This is unfair competition and equivalent to price-cutting.

Knowing the Net Profits Daily.

Mr. Brand bases his argument and outlines his discovery on the proposition that to succeed a business manager must have an accurate registration of his business efficiency. He must have some system which shows him the pulse beats of his business and tells him how much profit is being produced, if any, and how much can be made by a scientific manager. Mr. Brand explained and demonstrated his condensed system of accounting, which he claims effects a saving in labor of from 10 to 50 per cent, requires fewer books, less skill, gives a continuous balance, is available at any time, restricts errors to a day's duration, gives the complete assets and liabilities at all times, and gives the firm an opportunity of viewing its affairs at the close of each day's business in eactly the position it occupies.

The Society for Electrical Development.

The open session on Wednesday evening brought out a very interesting presentation of the plans and policies of the Society for Electrical Development, Incorporated. H. H. Cudmore, of the National Lamp Works of the General Electric Company, aroused a great deal of enthusiasm with the presentation of facts and figures relating to the growth of the idea and the large number of accessions which have already come into the organization. Mr. Cudmore read letters from Thomas A. Edison and from Frank A. Vanderlip endorsing the plans of the Society and he called upon those jobbers and manufacturers who had not had time to investigate the subject to take example from these busy men and lose no time thereafter in becoming acquainted with the plans of the Society and making a quick decision with respect to their ability or disability to adhere to the Society. Supplementing Mr. Cudmore's remarks, E. W. Rockafellow of the Western Electric Company, described the participation of the electrical supply jobbers in subscribing their efforts to the development of the organization. Approximately 70 per cent of the membership was affiliated with the Society for Electrical Development, and the jobber was proud of his enterprise in thus becoming in the early days an important factor in the work of this organization.

W. N. Matthews, Reigning Jupiter of the Jovian Order, also discussed the work of the Society for Electrical Development, and pledged his personal assistance in any work that the Jovian Order might do in furthering the plans of the Society.

The subject was also discussed by Mr. Gray, who pointed out that one of the important features of the Society's work lay in its opportunity for allowing all elements of the industry to contribute a very small amount individually and yet reap a great benefit in ultimate results. Only a few of the larger manufacturing organizations and only a few of the larger central stations had resources which were adequate for the gathering about them of organizations which could reach out and get in touch with the ultimate consumer. Outside of this comparatively small number of manufacturers and central stations who could afford to carry on campaigns of publicity there were a great many manufacturers and a great many central stations who could not now and probably never would have resources sufficient for the conduct of an adequate publicity campaign. The Society for Electrical Development, therefore, appeared to be the solution of the problem of all the elements of the industry contributing to a general fund for the provision of an adequate organization to reach out to all the people who in turn would reflect a demand upon all the contractors, upon all the jobbers, and upon all the central stations.

The golf tournaments, both for the manufacturers and jobbers, were ably handled by H. R. Lucas, the ladies card events were handled by J. A. Worth, and the billiard and pool tournaments by W. T. McCullough. The prize winners were:

GOLF TOURNAMENT, JOBBERS.—Silver Deposit Decanter, F. D. Van Winkle; Golf Bag, F. R. Elliott; Nela Cup, N. G. Harvey; Head Lights, J. H. Garron; Tail Lights, C. S. Scudder; Vibrating Horn, H. Lucas.

GOLF TOURNAMENT, MANUFACTURERS.—Silver Deposit Water Jug, V. R. Lansingh; Golf Bag, H. L. Everest; Pitcher, R. F. Valentine; Side Lights, F. P. Vose; Motor Horn, J. P. Hill; Trouble Finder, C. S. Walker.

BILLIARDS.—Silver Deposit Decanter, H. C. Moran.

POOL.—Silver Deposit Pitcher, H. E. Watson.

LADIES' EVENTS — 500 AND BRIDGE.—Cologne Bottle, Mrs. Hutchisson; Cologne Bottle, Mrs. Wilson; Samovar, Mrs. Litscher; Toaster Stove, Mrs. Savage; Chafing Dish, Mrs. Pierce; Frying Pan, Miss Sibley; Frying Pan, Mrs. Patton; Fan Motor, Mrs. Herstein; Fan Motor, Mrs. Barton.

The next meeting of the Electrical Supply Jobbers' Association will be held late in February, at Washington, D. C. E. C. Graham, of the National Electrical Supply Company, is to be the unofficial host, and has promised the jobbers a list of national speakers and a general all around good time at the Nation's capital. There is considerable discussion of the probability of holding the May, 1915, convention at San Francisco, Cal. The latter matter has been referred to the finance committee.

Among those in attendance were the following: H. C. Adams, Jr., W. J. Anderson, H. P. Andrae, A. I. Appleton, M. B. Austin, George N. Beatty, H. D. Betts, Robert C. Buell, A. Hall Berry, E. G. Bernard, W. S. Bissell, A. Bournonville, C. O. Brandell, Paul Bauder, W. I. Bickford, C. E. Browne, William K. Browne, W. J. Burns, Jr., J. A. Burke, S. A. Chase, W. H. Colman, C. E. Corrigan, A. J. Cole, H. H. Cudmore, G. E. Cullinan, N. C. Cotabish, J. C. Dallam, A. D. Dana, T. M. Debevoise, W. M. Deming, V. R. Despard, L. O. Duclos, M. P. Ellis, A. P. Eckert, G. W. Elliott, Frank W. Eastman, C. L. Echelman, A. Foster, W. F. Field, A. C. Garrison, L. V. Garron, Geo. L. Gillon, William Gloeckner, R. D. Gloeckner, E. C. Graham, H. L. Grant, H. S. Greene, E. F. Grier, Thomas G. Grier, A. A. Gray, G. B. Griffin, H. Griffin, A. E. Howe, A. L. Hallstorm, Charles A. Harding, F. S. Hardy, G. H. Harter, H. H. Harter, John J. Hartwig, N. G. Harvey, Morton Havens, Jr., W. R. Herstein, C. L. Hight, G. F. Holly, J. H. Hughes, C. R. Hunt, H. Hutchisson, H. H. Hornsby, A. F. Hills, J. G. Johanneson, H. O. Jones, A. B. Jumonville, E. B. Kittle, C. H. Kelley, H. W. Kilkenny, Frank Kuhn, H. B.

Kirkland, B. G. Kodjbanoff, L. W. Kittman, P. S. Klees, H. G. Knoderer, J. J. Leahy, A. W. Lindgren, C. H. Litscher, H. R. Leonard, L. M. Levine, Herman Larson, A. Lockwood, A. B. Lyon, P. F. Lyons, G. F. Marriott, W. N. Matthews, D. H. Murphy, H. P. Moore, M. McGraw, F. J. McKittrick, W. W. Merrill, A. S. Merrill, H. S. Nelson, H. Nickerson, W. H. Noelker, W. A. Oberlander, Percy Oblinger, Thomas J. O'Brien, Franklin Overbagh, H. T. Paiste, McKew Parr, W. Parritt, Jr., George L. Patterson, John Perry, L. F. Philo, I. A. Parker, J. A. Pizzini, Harvey Pond, I. M. Post, F. S. Price, George W. Provost, J. J. Raftery, E. W. Rockafellow, James Richardson, T. C. Ringgold, Warren Ripple, W. D. Steele, L. A. Schwab, Charles Scudder, Charles P. Scott, A. J. Selzer, G. W. Shimp, John Sherman, W. S. Sisson, G. S. Smith, J. M. Smith, B. H. Scranton, Charles J. Stahl, E. M. Scribner, F. G. Skeel, F. E. Stow, Frank Stuart, A. I. Sundheimer, T. O. Strong, L. M. Taber, A. S. Terry, Frank C. Teal, W. W. Tenney, Oscar C. Turner, W. R. Thomas, J. D. Underhill, F. C. Vose, John F. Walsh, C. G. Walker, J. F. Ward, J. B. Ward, Albert S. Weigold, T. G. Whaling, James Wolff, M. B. Wheeler, G. H. Wentworth, C. F. White, E. Whittemore, R. L. Wildauer, J. A. Worth, H. R. Worthington, H. E. Watson, Edward H. Weigle.

Mr. Oscar Turner, president of the Turner Electric Supply Company, was a guest of honor at the banquet of the Birmingham Chamber of Commerce on the evening of Friday, October 24, celebrating its annual meeting and home-coming reception to representative Oscar W. Underwood. This was probably one of the greatest demonstrations which has been held in Birmingham, of which progressive city the genial Oscar is a leading citizen and business man.

The Monarch Electric & Wire Company, of Chicago, Ill., is conducting a special sales campaign on heating devices and its Monarch electric washer, the results being far beyond its expectations.

Railway Electrification Around Havana, Cuba.

A plan to electrify all passenger lines leaving Havana, Cuba, to Rincon, the distributing point of both the United Railways and the Western Railway, will be put into operation as soon as possible. The Havana Terminal Company has already placed orders for several new storage-battery cars which will be used in establishing lines connecting with Artemisa, Guira de Melena, Bejucal, San Antonio de los Banos, and other places in Havana Province. Joseph E. Barlow, of Havana, has asked the city council to grant him a concession for erecting an elevated railway from Havana to Buena Vista, Camp Columbia, and other nearby places.

Registration at Illinois.

There are 257 students enrolled in the course in electrical engineering at the University of Illinois for the current year. There are 1,178 in the entire College of Engineering, which includes architecture.

Legal Notes

TRESPASS ON FOREST LANDS.—The United States Circuit Court of Appeals, sitting at St. Paul, has decided that the Utah Power & Light Company, of Logan, Utah, has no rights to the land which it is occupying within the boundaries of the National Forest in Cache County, Utah. This decision reverses the District Court of Utah. The power company had constructed a transmission line over public land included within a national forest.

TRANSMISSION CONTRACT.—The Tennessee Eastern Electric Company has filed suit in the federal court at Greenville, Tenn., against the Watauga Power Company, to compel specific performance of a contract to supply energy to a transmission line. The Tennessee Eastern Electric Company supplies Johnson City, Jonesboro and Greenville, and built a transmission line from Johnson City to Elizabethton at a cost of $20,000. The Wautauga Power Company contracted to supply power to this line at Elizabethton. While construction was in progress the Doherty interests purchased the Watauga Power Company and refused to carry out the original contract.

CUYAHOGA FALLS SUIT.—The case of the Cuyahoga Power Company against the Northern Ohio Power Company will finally come to trial after long litigation over a demurrer filed by interests associated with the Northern Ohio Traction & Light Company. The Cuyahoga Power Company several years ago filed condemnation proceedings on lands and water rights now occupied by the combined steam and hydroelectric plant of the Northern Ohio Traction & Light Company at Cuyahoga Falls. A suit for condemnation against Henry A. Everett, at that time owner of the land, was filed under its rights of eminent domain. The land was afterwards transferred to the Northern Realty Company and later to the Northern Ohio Power Company, a subsidiary of the Northern Ohio Traction & Light Company. It was on this land that the latter company erected its power station.

The demurrer alleged that the description of the property was not sufficiently definite to sustain the action. This demurrer was carried through various courts up to the Supreme Court of the state, which decided that the description was sufficiently definite and remanded the suit to the lower courts for trial on its merits. The power plant of the Ohio Traction & Light Company cost about $2,000,000 and if the company loses the suit it would have no property right in the site of the plant.

RAISING FRANCHISE RATES.—The Kentucky Court of Appeals has upheld an agreement made between the city of Lexington and the Fayette Home Telephone Company of that city, whereby higher rates than those provided in the franchise of the company are charged. The provision for higher rates was made by the mayor with the approval of the council, and was objected to by a citizen, who sued to have the franchise rates enforced. The court held that the agreement was properly made.

DOUBLE TAXATION.—Four electric traction companies leased by the Ohio Electric Railway Company, of which the Dayton & Western Traction Company is one, have instituted suit for the return of taxes paid to the Government on the basis of their net income. Since the Ohio Electric Railway Company paid a corporation tax upon the net income of the four roads, the plaintiffs claim that they should not be taxed a second time upon the same income.

LETTER TO THE EDITOR.

Fees For Design Patents.

To the Editor:

May we call the attention of your readers to the important decision just rendered by the Commissioner of Patents in regard to the payment of government fees in applications for design patents? Heretofore, we have had the curious situation that an application for a 17-year patent on a new appliance, machine or process required a government filing fee of only $15.00, while an application for a design patent running for the maximum term of 14 years required a fee of $30.00 to accompany the same. Since the examination of applications for design patents as to their novelty requires much less time and study than that regarding the novelty of structural or process patents, this discrepancy has been unfair to those having ornamental devices which they wish to protect, for the government fees are not returned if the application is rejected and the applicant for a 14-year design patent therefore had to risk twice as large a fee as one for a 17-year structural or process patent.

Realizing the unfairness of this situation, the new Commissioner of Patents has now decided (by a ruling published in full in the *Official Gazette* for November 4) that an applicant for a design patent who has paid the minimum fee of $10.00 corresponding to a 3.5-year term of patent can change his application at any time before the formal allowance thereof by paying the additional $20.00, so as to have the patent issue for the 14-year term. In other words, the applicant now only needs to risk the $10.00 government fee, as any shrewd patent attorney should be able to handle the application in such a way as to permit the applicant to pay the difference after the Patent Office has indicated that the application is likely to be allowed.

In view of the continually increasing number of cases where appliances are designed with quite distinctive ornamental shapes or features, this new interpretation of the statute should lead to a more frequent use of a form of protection which has heretofore been restricted because of the heavy risk involved by the high initial fee.

LOTZ & SCHEIBLE.

Chicago, Ill., November 19, 1913.

Telephone From Holland to England.

A submarine telephone is to be laid between Holland and England. The length of the cable will be 105 miles. According to estimates, the total expense will be near $3,000,000, and will be borne jointly by the two countries.

Joint Meeting in New York.

Following a dinner, the New York Sections of the Illuminating Engineering Society and the National Electric Light Association met in the Edison Auditorium, 44 West Twenty-seventh Street, on the evening of November 17.

S. G. Rhodes, engineer of meter testing for The New York Edison Company, presented a paper on "Installation, Metering and Street Lighting Methods Abroad." Mr. Rhodes has recently returned from an extensive trip to England and the continent, where he visited a score of the larger central stations, studying their installations, methods, etc., and his paper brought forth many inquiries concerning patterns of meters used in Europe, street-lighting effects and various questions of conducting the central-station business.

C. F. Lacombe, chief engineer of the Light and Power Bureau of the Department of Water Supply, Gas and Electricity, who also has just returned from a European trip, was present and added a few remarks to Mr. Rhodes' paper. He spoke particularly of the general street lighting in Europe being better than that in America, although there are no actual "White Ways" on the other side.

H. W. Jackson, of the General Electric Company's laboratories at Harrison, N. J., explained and demonstrated some new types of incandescent lamps soon to be placed on the market. He also exhibited Edison's home moving-picture machine run with an incandescent lamp. Alexander Maxwell then displayed Claude's neon-tube lighting.

The Auditorium was crowded and the audience evidenced much interest by the number of questions asked.

New Membership Booklet for Development Society.

The Society for Electrical Development has distributed to its members a new membership list dated November 15, 1913. This supersedes the list issued on October 1.

The rapid growth of the Society in membership is shown by a comparison of these two booklets. That for October 1 contained the names of 631 central stations, manufacturers, contractors and jobbers, while the booklet dated November 15 carries 951 names of firms in the electrical field.

The total amount of funds pledged to the Society's work closely approximates $160,000, and it is believed that the Society's activities will begin about the first of next year.

The membership campaign carried on by the sales organizations of a number of manufacturers who are members of the Society has proved effective, as shown by the above figures.

Meeting of Land Grant College Engineering Association.

The Land Grant College Engineering Association was organized in February, 1913, and includes the presidents and deans of engineering or other authorized representatives of engineering divisions of the land-grant colleges in all the states. Nearly all of the states have joined the Association. It is essentially a meeting of managers of the engineering work at these institutions to discuss important questions of policy and work in their administration.

The Association is applying for admission to the Association of American Agricultural Colleges and Experiment Stations, which for nearly thirty years has represented the agricultural educational interests and policies.

The second annual meeting of the Land Grant College Engineering Association was held in Washington, D. C., November 11 to 14, at the same time as the meeting of the Association of American Agricultural Colleges and Experiment Stations. Thirty-three states were represented. Among the topics on the program was "The History of Land Grant Institutions, and the Meaning of the Term 'Mechanic Arts,' as used in the Organic Laws," by J. P. Jackson.

The officers for the coming year are as follows:

President: A. Marston, Iowa.

Secretary-treasurer: G. W. Bissell, Michigan.

Vice-presidents: President Demarest, New Jersey; President Sparks, Pennsylvania; Commissioner Claxton.

Members of the Executive Committee: H. W. Tyler, Massachusetts; Edward Orton, Jr., Ohio; C. H. Benjamin, Indiana.

Traffic Signals in Cleveland.

Experiments are in progress in Cleveland, O., with a new type of electric traffic regulator. The device is operated by traffic patrolmen stationed on a slight elevation at street intersections. Red lights flash a warning to stop and a white light signals safety for traffic. An automatic bell takes the place of the patrolman's whistle.

Strike at Schenectady.

It was voted on November 24, to call out all union workmen at the plant of the General Electric Company, Schenectady, N. Y., on the following morning. Trade-union officials in a statement announcing the strike said 12,000 men will be affected by the order.

The number of anthracite coal mines in Pennsylvania in 1912 was 275 and the average output of each was 289,456 short tons.

FIFTH ANNUAL CONSERVATION CONGRESS.

Discussion of Water-Power Policy.

The discussion of water powers occupied a prominent place in the deliberations of the fifth National Conservation Congress, held at Washington last week, and in the resolutions adopted there was provision for giving this subject a prominent place upon the program at future congresses. These resolutions also included the following relating to water power:

Whereas, concentrated monopolistic control of water power in private hands is swiftly increasing in the United States, and far more rapidly than public control thereof; and

Whereas, this concentrating, if it is fostered, as in the past, by outright grants of public powers in perpetuity, will inevitably result in a highly monopolistic control of mechanical power, one of the bases of modern civilization, and a prime factor in the cost of living; therefore,

Be it resolved, that we recognize the firm and effective public control of water power corporations as a pressing and immediate necessity urgently required in the public interest;

That we recognize that there is no restraint so complete, effective, and permanent as that which comes from firmly retained public ownership of the power site;

That it is, therefore, the solemn judgment of the Fifth National Conservation Congress that hereafter no water power now owned or controlled by the public should be sold, granted, or given away in perpetuity, or in any manner removed from the public ownership, which alone can give sound basis of assured and permanent control in the interest of the people.

The Committee on Water Power submitted three reports. The first of these was presented by George F. Swain, the chairman of the Committee, and constituted the majority report. It was signed by Lewis B. Stillwell, M. O. Leighton, Edwin S. Webster and B. M. Hall, in addition to the chairman. The principal portions of this report are given below. A minority report was presented by Gifford Pinchot, Henry L. Stinson and Joseph N. Teal. This followed largely the lines of the address made by Mr. Pinchot and reported in our last issue. Two members of the Committee, Charles R. Van Hise, president of the University of Wisconsin, and A. F. Lever, Congressman from South Carolina, did not sign either report. The third report consisted of unanimous recommendations made by the entire committee. These were adopted by the convention by a three-to-one vote, but no action was taken upon the two other reports.

Report of the Committee on Water Power.

The conservation movement in the past has done great service to the country by directing the attention of the people to the urgent necessity of preserving to themselves and providing for the wise utilization of the country's water powers. The Committee desires to express its appreciation of the work of those who inaugurated that policy.

A prominent feature in the water-power situation of today is the danger of unregulated monopoly. The fact that 10 groups of interests control 65 per cent of all the developed water power in the United States, and that some of these groups are closely related through interlocking directors shows the dangers to the public interest that might arise if no measures of restraint in operation were exercised by the people.

The central need as to water power in the United States is development on terms fair both to the public and to the power interests. While it must not be forgotten that the common operation of several water powers, by equalizing the load at different times, by reducing the danger of complete breakdown, and in other ways, has legitimate and real public advantages, these advantages must be so controlled that the public shall always receive full benefit therefor.

There are three essentials of a sound water-power policy: (1) prompt development; (2) prevention of unregulated monopoly; (3) good service and fair charges to the consumer.

The regulation of service and charge is usually a state or local function. It should be exercised by the nation only in interstate industry and possibly when the failure of other agencies might result in abuses.

Water power presents a peculiar characteristic in that its conservation is a double conservation. The utilization of water power for a purpose for which steam power, or some other form requiring the use of fuel, would be employed, is not only the utilization of a freely given resource which would otherwise be wasted, but it involves the saving of a corresponding amount of one of the non-renewable resources.

There is another peculiarity of water power. It arises from the water flowing in a stream, but this stream affords other uses, as for irrigation, water supply, and navigation. For the proper conservation of the water in a stream, all these four uses must be considered. Its development for one purpose must, so far as possible, be consistent with its development for the others. All must be developed so as to be productive of the greatest total good. The four uses above referred to are inseparably connected, particularly the use of a river for water power and for purposes of navigation, in cases where both of these uses are economically practicable.

This difference between water power and the other natural resources leads necessarily to the conclusion that the fundamental principle to be kept in mind in the case of water power is one almost diametrically opposite to that which should be kept in mind in the consideration of the others. In conserving the non-renewable resources, restriction, economy, frugality, even parsimony, should be the governing principle. Waste should be eliminated to the utmost degree possible and use should be curtailed so far as this can reasonably be done. We all agree that conservation means wise use, and that use should be with a minimum of waste, with the maximum efficiency, and with due regard to the future.

In the case of water power, however, a point of view almost the opposite of this—within proper limits—would seem to be the true one. Here, instead of restriction, the greatest possible use should be advocated. That use should not be wasteful, nor is it consistent with sound principles of public and individual economy, to have it used for extravagant or unecessary purposes; but *any proper use* is better than *no use at all*, for every use, for an object that would otherwise be indulged in, conserves a non-renewable resource. In the one case, therefore, our guiding principle is restriction; in the other case, it is the encouragement of the greatest possible economical development. The power should be so utilized as to produce the greatest good to the greatest number.

These principles should distinctly affect our attitude toward water-power enterprises. There would seem to be no form of individual enterprise more worthy of encouragement, or which in the interest of true conservation should be made more tempting to the investment of capital than the development of water powers. Our laws and regulations governing the development of water power should properly be made so that an adequate rate of return to the investor might reasonably be anticipated.

There seems to be an impression among some people that since water runs down hill, water power can be developed at very little cost and with very little risk. Such an impression is, in many cases, very far from the truth. There is, of course, a great difference in local topographical conditions. Sometimes a water power may be developed at slight expense, but in many cases, if not in most cases, and especially in the case of the largest water powers, a very large investment of capital is necessary for their utilization. Moreover, the risks attending this investment are often serious. Floods may destroy the works during construction, unforeseen contingencies of various other kinds may largely increase the cost, the flow of the stream may not prove to be what was anticipated, and this flow may be injuriously affected by the operations of man or the agencies of nature acting above the power site. The history of water-power enterprise is not by any means a history of unbroken successful effort. It is strewn with wrecks, and there would seem to be no industrial fied in which a sound engineering preliminary judgment, as well as careful construction and economical financing, are more necessary.

It remains to consider some of the dangers with which such development may be attended, and the attitude which the government and the states should take towards the subject.

It is perfectly clear that in order to induce the investment of private capital in water-power enterprises, three things are essential: (1) definiteness in the contract entered into; (2) the prospect of a sufficiently attractive return, commensurate with the risk involved; (3) the protection of the courts in case of dispute. Without these three things the utilization of water power by private capital cannot be brought about.

It is generally admitted, and it has been decided by the courts, that the Federal Government has full power over the interests of navigation on navigable waters, control of rates of public service corporations engaged in interstate commerce, and, according to the decision in the "Minnesota Rate Case," a certain amount of control also over rates for intrastate commerce when carried on by corporations doing also an interstate business. The Federal Government also has, of course, complete jurisdiction over the public lands. If, therefore, water powers are developed on navigable streams, or if the power site or the right of way for transmission lines lie in the public domain, the Federal Government may impose such restriction and regulations as it deems best.

At the outset we must bear in mind the radical distinction between public utility corporations and private individuals. The former are by law subject to public control as regards rates and service, and, therefore, a permit granting a right to such a corporation need not contain any stipulations as to the rates charged to consumers for the service rendered.

Most of the state now have public service commissions and those that have not will undoubtedly provide them when the inhabitants thereof consider that the proper time has arrived. The public being thus safeguarded, there is no valid reason why a public service corporation doing an intrastate business solely should be subject to any added control, as to rate or service, than that of the state to which it is necessarily subject in any case.

In the case of private concerns, however, there is no public control and the permit should contain all stipulations which may be considered necessary to preserve the interests of the public.

Considering then in the first place the case of navigable streams, there are two special cases to be considered: (1) where the Government builds dams to improve navigation; (2) where the government grants permits to individuals or corporations to build dams for the development of water power.

If the Government builds dams to render a river navigable, the water power developed is a by-product of the navigation works. If it allows others to build dams for water-power purposes the improvement to navigation is a by-product of the power development.

(1) At Government dams in navigable streams it is most desirable in the interests of conservation that the surplus power beyond the needs of navigation should be utilized. Inasmuch, however, as the Government has built the dam, there can be no question that any permit or grant for the use of power should require the grantee to pay a reasonable compensation therefor to the Federal Government. It is true that the amount of such compensation may in some cases be passed on to the consumer, and represented by an increased rate for power. In other cases, where water power competes with steam, there will be no necessary increase in rate due to the government charge. Nevertheless, this charge should be paid to the Federal Government and not to the consumer in the form of reduced rates, for the reason that the cost of the dam has been paid by all the people, and all the people should, therefore, receive the benefit of the value accruing therefrom.

The amount of such compensation should clearly depend upon circumstances. In some cases the works constructed by the Government may cost but a small fraction of the total cost of power developed, while in other cases the ratio may be large.

In the case of private concerns at government dams, the proper method of fixing the charge involves many difficulties. The best plan appears to the Committee to be to authorize the Secretary of War to issue permits in such cases providing for fixed or definitely varying rates for power with a definite preliminary period of small payment, if he deems desirable. Many difficulties incident to this question would be avoided if every user of water under a government permit should incorporate as a public utility corporation.

(2) At dams on navigable rivers constructed by public service corporations, or by private parties, the first requisite is that the plan of development should be subject to Government approval, in order to insure that the project will not interfere with the proper development of the stream for navigation; and further, the operation of the plant should not restrict navigation. It should, therefore, be required that before the right to construct a dam and utilize water power upon any navigable stream is granted by the Federal Government, there should be a survey of at least that portion of the stream, the regimen of which would be affected by the proposed construction, and a further requirement that the dam and works should be built in such a manner and of such dimensions as not to interfere with the ultimate proper development of the stream as a navigable waterway.

The General Dam Act provides that the grantee should, when required by the Secretary of War so to do, construct locks suitable for navigation, and to furnish power and water for operating them, and also to light the Government buildings and grounds.

This case differs from the one previous considered in the fact that the power development may be of great benefit to the Government in aiding the navigability of the stream, and the Government pays nothing for these works, but secures the benefit of the dam and the pond above it, and the flowage rights, without any expense. Projects of this kind would, therefore, materially aid the Federal Government in securing the navigability of our inland waters, and if we can imagine the case in which a stream were fully utilized for water power by a series of dams, each backing the water up to the next and all provided with locks, the water power development would at the same time render the stream completely navigable, without any expense to the Government.

As to the charge therefor which the Government should exact, in such cases, this might fairly be materially less than in the case of water power utilized at Government dams. Circumstances will differ, however, in different cases.

The preservation of the Government rights, whatever they may prove to be, being recognized by the principles that the Government must give a permit and fix its terms, we believe that in many cases the real interests of conservation will be best subserved by making no government charge, the improvement of navigation brought about by the construction of the dam and locks being accepted in lieu of charge. In other cases, some charge may be desirable.

Many methods have been proposed for regulating the charges made for power by the Federal Government. The best method appears to the Committee to be, in the case of public service corporations, to allow the corporation to earn up to a reasonable fixed return upon the money properly invested before being subject to any charge, this return being different in different parts of the country, and to divide the earnings in excess of such limit with the Government in some definite manner, the method of division to be subject to revision at fixed intervals of time, the first interval being the longest, and sufficiently long to be financially attractive, the books of the company being also open to Government inspection.

In any case the primary object, whether of the Federal Government or the states, should be the encouragement of properly regulated power development, and the collection of revenue should be subordinate. To grant water-power privileges under such onerous terms or regulations that development is hindered is an injury not only to the people of the state, but to the people of all the states, because all are concerned in the preservation of the non-renewable resources. It is more important that a wise development should be encouraged and that the consumer should obtain his power at the lowest rate consistent with a proper return on the money invested, than that the Government, whether federal or state, should participate in the profits.

(3) In the case of water powers in which the power site or the right of way for transmission lines is on Government lands, the Federal Government should unquestionably grant permits in such form as will not only insure proper control and provide that the use of such lands shall not injure the remaining government lands, but that the public interest should be fully protected in the future. In such a case the government fee might perhaps best be fixed in the same manner as that recommended for navigable streams.

Notwithstanding the fact that electricity is playing every day a more important part in our social and industrial economy, and the fact that the development of hydroelectric properties should be proceeding rapidly, there seems no doubt that present federal laws, and the permits hitherto issued under them, have brought about a condition of relatively slow development of water power. These laws constitute in many cases a practically insuperable obstacle, and while many developments have been made under these laws, many more possible developments have been postponed. Several Secretaries of the Interior have called attention to these facts, and to the urgent need of a revision of the laws regulating the use of water power. Water-power development, if undertaken today on the public lands or on navigable streams, are attended by serious financial difficulties.

One of the most serious obstacles to the development of water powers under government permits is that these

are, by law, revocable at any time, at the pleasure of a member of the Cabinet. Under present laws the only way by which water power can be developed on the public lands is under revocable permits prescribed by the Act of February 15, 1901.

On navigable streams the General Dam Act of June 23, 1910, provides for a fixed term of tenure of fifty years, subject to revocation for violation of terms, and without provision for renewal. Neither of these Acts suitably provides for a tenure that will attract private capital, and thus development is either defeated or made precarious, and the whole public suffers accordingly.

There are, in general, three forms of franchise or concession, namely, the perpetual, the fixed term and the interminate. For reasons which need not be discussed here and with which nearly all will agree, the perpetual franchise may be considered a thing of the past. The crude fixed-term franchise which grants rights for a limited period of years, without provision for renewal or for compensation at the end of the franchise term, has proved to be an impracticable thing, under which financial organization is either impossible or too expensive, and during the term of which —and especially during the last part of the term—profitable operation becomes almost impossible. Securities under the fixed-term franchise can be disposed of only at high rates of interest and discount, the fixed charges under which make a great drain upon annual earnings. Such a franchise also necessitates the creation of an amortization fund which will, at compound interest, equal the investment at the end of the franchise period. Moreover, under this form of franchise, it is impossible for the operating company, especially during the latter years of the term, to make contracts for the sale of power covering long periods. Long-period contracts are becoming more and more common and necessary in every-day public service operation, and crude fixed-term franchise operates in direct opposition thereto. To cover all of these difficulties, the modified fixed-term franchise is advocated by many. Such a franchise provides for right of renewal at the end of the period, for purchase of property improvements in the event that the extension is denied or the title thereto transferred, and finally for the assumption of contract obligations entered into by the grantee for periods extending beyond the close of the franchise term. Such provisions may largely obviate the financial and other difficulties and uncertainties that usually attach to the fixed-term franchise.

The Committee believes, however, that under all conditions that prevail with reference to publicly owned water powers, whether by the Federal Government or the states, the indeterminate franchise is the form which most readily adapts itself to changing conditions, and that under which the greatest and most satisfactory measure of control may be secured by the public.

The indeterminate franchise favored by the Committee would have no fixed-term limit. For an initial period sufficient to allow the grantee to properly finance the project the franchise should be irrevocable except for cause, subject to review by the courts. Said franchise should after the said period has elapsed, be subject to revocation by the Government at any time on due notice to the grantee of such intention and on payment of compensation equivalent to the fair value, exclusive of franchise, of the property and necessary appurtenances or of so much of it as is dependent upon or intimately connected with the water-power development, and without value when separated therefrom, but such value shall not include properties such as railroads, lighting systems, etc., which are of themselves separate industries. In such transfer all contracts for the sale or delivery of power made by the grantee previous to such notice of transfer should be assumed by the transferee, so that said grantee may operate and maintain the power business during his occupancy of the property under such stable guarantees as may beget confidence therein by prospective long-term contractors provided that the Government or said transferee shall not assume any contracts made at a price or under conditions which may be established as unreasonably low for the service rendered or which may be found to be confiscatory.

In view of the above, and of other considerations, the full treatment of which would require more space than can properly be claimed for a report of this kind, the Committee believes that the development or conservation of water powers, together with the proper protection of the public interest, can best be secured by the enactment in Congress of legislation which will contain the following provisions:

(1) The granting, without distinction, to all states and governmental subdivisions thereof, and to all public service corporations charged by any state with the power so to do, the right to construct, maintain and operate dams in any of the navigable streams in the United States and territories and inland possessions thereof, provided that such maintenance, construction and operation does not adversely affect the navigable qualities of such navigable streams; and provided further that the grantee shall construct and shall at all times maintain and operate such dams under the supervision of and in the manner to be approved by the War Department of the United States; and shall construct and maintain locks and other necessary appurtenances in such dams when required so to do by the Secretary of War, and subject to his approval; and shall, without cost to the United States Government, at all times provide the necessary water, power and light required by the Government for the operation of said locks, and shall, under the supervision of the Government, maintain the water at such heights in the pond created by such dam as may be required by the Government to best facilitate navigation. Upon an application being made to the Secretary of War for a grant to construct, maintain and operate any of such dams it should be the duty of the Secretary to take testimony at public hearing before a commissioner of the United States Court to establish sufficient information of record to determine whether or not the construction, maintenance or operation of such dam will adversely affect navigation. Such Commissioner, after full hearings, shall make findings of facts on this point and file the same, as a public document, with the Secretary of War, and such findings shall be conclusive and final as to whether or not navigation will be adversely affected in the premises, but if either the Secretary or the applicant believes that the findings are not in accordance with the evidence, such dissatisfied party shall have the right to appeal to the United States District Court in the district where the proposed improvement is located and the adjudication of the question in controversy by the Court shall be binding upon both the Government and the applicant.

(2) The granting to all states and governmental subdivisions thereof and to any public service corporation organized under the laws of any state and authorized by said state so to do, the right to receive on suitable application an indeterminate grant by the Government, but such indeterminate grant to be in the nature of a contract between the Government and the grantee; the grant being made in consideration of certain developments, improvements and public use by the grantee, with the condition that the grantor may, at any time after a fixed period, terminate the grant as above explained.

(3) The grantee, if a public service corporation, shall at all times be subject and amenable to the lawful regulation of its charges for service and of the character and quality of its service; such regulation to be by any governmental body at the time having authority in the premises, but such regulation shall, if possible, be by only one governmental body.

(4) In the event that the property of the grantee (whether said property be upon navigable streams or upon the public domain) shall be acquired by the Government through condemnation proceedings, the grantee shall never plead any value in the way of anticipated profits in excess of such reasonable rate of return as the courts may hold under the circumstances is proper for the grantee, as a public servant, to accept.

(5) The payment for water-power franchise granted to be provided for by allowing the corporation to earn up to a defined per cent upon the money properly invested, such percentage to be dependent upon circumstances, and different parts of the country; any excess of earnings above such percentage to be divided with the Federal Government (or in the case of a grant by a state with the state) in some defined manner, the rate of division to be subject to revision at periodical intervals, the first period being the longest; and long enough to make the development financially attractive; its books to be open to government inspection. In the case of a development in which the Federal Government has no interests, but which is under control of a state, a similar permit to be used.

(6) The granting to private concerns by the Federal Government of the right to construct, maintain and operate dams on navigable streams under same conditions as above enumerated, excepting those under (5), instead of which the Secretary of War shall be authorized to make such agreement with the grantee with reference to terms of payment as he may deem just and reasonable.

(7) No speculative holding of unde-

veloped power sites should be permitted, and no transfer or assignment of any grant should be made without authority from the Government.

Finally we repeat that for the conservation of our water powers it is essential that capital shall be attracted to these enterprises, and while we must, of course, fully protect the interests of the public, both present and future, we are not conservationists if we advocate the imposition of terms which restrict rather than encourage development. We must also remember that under present conditions water-power investment are not especially attractive, and that steam power is a more desirable form of power, since it can be located wherever needed, and the supply regulated according to the demand. Water power is more variable, and furthermore, it requires, in general, a very much larger investment per horsepower than steam, though its running expenses are less. Because of the large first cost of water-power developments the risk of loss in case of failure of the enterprise is correspondingly large. Capital, therefore, does not need water-power enterprises, and it will not take them up to any considerable degree, unless fully protected.

It is from a point of view of pure conservation that the development of water power is most important.

It has been estimated that we use annually over 480,000,000 tons of coal, worth nearly a billion dollars, in addition to many million dollars' worth of other fuel; and that some two hundred million dollars' worth of this fuel annually might perhaps be saved by the utilization of water powers. When we consider also that the development of water power not only conserves fuel, but directly serves to promote the navigability of rivers, we should be very careful how we discourage this triple conservation in order to secure other results which we may consider desirable. If we do discourage it we may be anti-monopolists, or something else, but we are certainly not conservationists.

Recommendations of Committee on Water Power.

The Committee on Water Power, while finding a difference of opinion among its members as to certain details of the subject, feels very strongly the importance of making clear the general principles which control it and realizes keenly the consequences which would follow a failure to agree upon a constructive program of progress. It has, therefore, framed the following brief statement of the recommendations upon which it is unanimous.

A grant of the right to use a water power, while differing in some details, is essentially similar to a grant of any other privilege or franchise from the Government, state or national, and its terms, regulation and control should be guided by essentially the same principles necessary to safeguard the rights of the public and of posterity as have been found essential in the case of other classes of franchises from the Government. Particularly is this true in view of the fact that a water power, being perpetual, will surely tend to increase in value as other sources of power, such as coal and oil, become exhausted. At the same time, for the very purpose of preserving our other power resources which are capable of exhaustion, the development of water power, under proper safeguards of the public interest, should be earnestly encouraged and hastened. We recommend that the following principles should govern the granting of a privilege to use a water power:

(*a*) For a definite period, sufficient to be financially attractive to investors, the privilege should be irrevocable except for cause, reviewable by the courts;

(*b*) Thereafter the privilege should continue subject to revocation in the absolute discretion of the Government exercised through its administrative board or officer upon giving reasonable notice and upon payment of the value of the physical property and improvements of the grantee as below provided under (*h*).

(*c*) After the expiration of the period provided for in (*a*) above, at recurring intervals of not more than ten years the amount of compensation to be paid to the Government for the privilege and all the terms and conditions of the grant during the next succeeding period of not more than ten years shall automatically come up for determination by the granting officer of the Government.

(*d*) The privilege shall be unassignable except with the approval of the Government, in order to safeguard the interests of the Government against speculation in water powers and against appropriation without prompt development.

(*e*) The privilege shall be granted only on condition of development of the whole capacity of the power site as rapidly as the granting officer may from time to time require, giving due consideration to reasonable market demands and conditions and also on condition of continuous operation, subject to such demands and conditions.

(*f*) The right to receive compensation for the value of the privilege varying according to the proper conditions of each case shall be reserved to the Government, state or federal, from whom the privilege comes. We believe that the reservation of such a right to compensate is a vital essential towards the end of proper regulation. It is not sufficient to trust that the public will always receive its proper share by means of regulation of rates alone. Local authorities may neglect or may be unable, under conflict of jurisdiction, or for other reasons, to exact in the interest of the public the full value of the public's right. The value of a water power may in the course of time increase far beyond the power of local regulation to adequately distribute its benefits. At the same time, the method of exacting compensation must be carefully safeguarded so that in case full compensation by rate regulation is exacted by local authorities, an additional burden shall not be imposed. We believe that in normal cases the best method is for the Government to share increasingly in the net profits of the enterprise, provided those profits exceed a certain reasonable percentage, the right of the Government being recognized otherwise merely by the imposition of a small annual fee or its equivalent.

(*g*) The Government shall have the right to prescribe uniform methods of accounting for the grantee and to inspect its books and records.

(*h*) Upon revocation of a privilege by the Government the grantee shall be paid a compensation equivalent to the fair valuation of its property, exclusive of franchise and consequental damages; this compensation shall include such appurtenances as are necessary for the operation of the water power and the transmission of electricity therefrom, but shall not include such properties as railroads, lighting systems, factories, etc., which are of themselves separate industries.

In such transfer all contracts for the sale or delivery of power made in good faith previous to such notice of transfer should be assumed by the transferee so that the said grantee may operate and maintain the power business during his occupancy of the property under such stable guarantees as may beget confidence therein by prospective long-term contractors, provided, that the Government or said transferee shall not assume any contracts made at a price or under conditions which shall be determined by the proper administrative officer of the Government to be unreasonable or confiscatory.

An address dealing with the subject of water power was made to the Congress on November 19 by Theodore E. Burton, United States Senator from Ohio, the main portion of which was as follows:

The Future of Water Power.

Conservation in its most comprehensive sense begins with the care of human life and human health. It requires the adoption of such policies that the resources of this country shall not be wasted or allowed to fall under monopolistic control. It not only recognizes that the supply of useful commodities such as timber and coal, have been wastefully depleted, but that new and greater utilities can be developed from agencies which for a long time have been in use on a limited scale, but which now are capable of an immense increase in creative power. This last applies especially to water power, to which I wish to direct my remarks.

The amount of energy employed in industry and transportation in this country, expressed in terms of horsepower, is estimated at 31,500,000, of which 5,500,000 is derived from flowing water and the remaining 26,000,000 from steam. The coal consumption, according to statistics for the year 1912, was 427,000,000 tons, made up of 78,000,000 tons of anthracite and 349,000,000 tons of bituminous. In the generation of this 26,000,000 of horsepower by steam, more than two-thirds of this enormous quantity of coal is consumed.

There is available in the United States 30,000,000 horsepower from water which can be readily developed. By the control of stream flow, construction of reservoirs, and invention of means for equalizing the maximum and minimum flow of water in rivers, the difference between which forms one of the greatest disadvantages in prospective water-power development, an additional quantity, probably 150,000,000 to 200,000,000, could be utilized. The former quantity of 30,000,000 horsepower can be brought immediately into use; the latter quanity, 150,000,000 to 200,000,000, is a resource of limitless value for the future. It is clear that water power will eventually become an industry of greater magnitude than any yet developed. It will become fundamental to all operations of manufacture or transportation which depend upon power for their operation and success. It is apparent also that through the medium of electricity it will be essential for the manifold minor utilities of our daily life. Water power utilized through electricity can-

not only run our trains and our factories and light our cities, but it can be used as the motive power for harrows, for plows, for transportation on highways, for heating and for the cooking of food.

In the days of our childhood, water power was of value only at the point of origin. The fall of a stream was used merely for turning a wheel and running a grist mill. It could not be transmitted even for short distances. Generally speaking, cities and manufacturing concerns were then, as now, located at places remote from these power sites or waterfalls. The invention of devices making possible high-tension transmission has made these remote sites fabulously valuable. Today an electric current can be transmitted, at a conservative estimate, 200 miles with very little loss. The area which can be supplied from one center is not less than 125,000 square miles, a territory surpassed in size by only three states of the Union. There is an aggressiveness in seizing these water-power sites hardly paralleled in the history of this country, which has already suffered enough from the exploitation of its natural resources. Thus far, their utilization has been halted by the lack of any well defined policy. The public interest should be most carefully safeguarded and on the other hand capital should be encouraged to invest in this invaluable national asset, with the promise of a fair and safe return.

The greatest embarrassment has been caused by the conflict between opposing ideas regarding national and state control. The differences which arise from these separate jurisdictions are in some particulars of the most vital importance, but no petty squabble arising from theoretical ideals about state and federal rights should interfere with the prompt and orderly utilization of this invaluable resource. In non-essentials, concessions should be made. In essentials certain principles should be sedulously maintained. In view of the extremely wide area over which power from a single source can be used, this problem is necessarily a national one. There is no form of enterprise which lends itself so naturally to consolidation and large-scale operations. In the first place, the cost of installation and transmission is minimized by the control of one company or affiliated organizations. Oftentimes in one watershed there may be an abundant rainfall and consequently a sufficient supply of power not merely for that area, but for others, while at the same time there will be a drought elsewhere. If, however, there is such consolidation it should be under the strictest supervision and control. In most cases it is impossible to exercise such control under laws and regulations framed by a single state. The national phase of the question is further emphasized by the fact that the most valuable power sites are located upon public lands or else transmission lines must cross the public domain; and, still further, by the incidental development of power in navigable streams which must be under federal control. Frequently, there is a necessary connection between the development of water power and improvements for the promotion of navigation.

The whole subject was considered for months and years, indeed, by the members of the National Waterways Commission. Two bills were introduced, one relating to power in navigable streams and the other to power on the public lands. The objects sought in these bills are prompt development under which private enterprise may be stimulated with proper supervision and control for the protection of the public interest.

The bills contain provisions to secure:

(1) Prohibition of the assignment of rights or franchises, except with the consent of public authorities so as to prevent monopoly.

(2) Reasonable prices to the consumer, to be enforced by the Federal Government, in case state or municipal authorities prove inadequate or neglect to solve the problem.

(3) The prevention of permanent control, so that future developments from invention or otherwise may inure to the public, for we cannot be sure what may be accomplished in the future or how universal the use of water power may become.

In considering the divers forms of franchises—those at will, indeterminate, or permanent with the privilege of fixing the terms at stated intervals—it was thought best to limit the duration of a franchise to 50 years, with a provision that at the end of that time the franchise shall terminate and the government may take possession or direct its transfer to others on payment of a suitable compensation. In any provision for compensation, the franchise or the added value which comes with years, the so-called unearned increment, shall not be taken into account. It was also thought desirable that ten years before the expiration of the 50-year term, there might be negotiations with a view to extension. The object of this is to prevent neglect or detorioration of the plant during the last ten years of the grant.

In the bill governing franchises in navigable streams, there are further provisions requiring, at the option of Congress or the executive branch of the Government, the construction of locks and dams for the promotion of navigation and the furnishing of power for the manipulation of the lock machinery. This requirement is manifestly fair. The Federal Government has undertaken on a large scale the improvement of rivers. Some of these flow through a level country where the cost of improvement is comparatively small. Streams, however, which flow through uneven or mountainous regions require numerous locks and dams and their improvement involves expense upon a colossal scale. In this latter case, in which water power is created in abundance, as compared with streams through level portions of the country, it is but fair that there should be a distinction and that the Government should utilize this asset to pay for the improvement of navigation.

The question of compensation to the Government has been very much discussed. In principle such compensation is fair. In the public lands streams which produce power are often closely associated with forests. The national forests are patroled and cared for at very great expense. In navigable streams the same rule which requires the grantee of a franchise to construct a lock and dam as a condition for enjoying a franchise would equitably be applied to compensation for other improvements in the stream. At the same time it is not intended by the advocates of compensation that it shall be of sufficient amount to impose any serious burden upon industry. In the practical application of the rule it would operate especially as a check on inordinate profits.

The Department of the Interior has recently issued a permit to the International Power & Manufacturing Company, which contains the strictest regulations. It is expected that under this permit water power amounting to 112,000 horsepower will be developed. Compensation for the permission is to be paid after 1923. There are regulations for determining the price to the consumer and providing that not more that 50 per cent of the power can be delivered to one consumer or used by the permittee. The permit is to be surrendered to the United States upon payment of compensation and the value of the property of the permittee is to be ascertained under provisions contained in the permit.

In this connection it may be stated that a decision of the Supreme Court has recently been rendered in what is known as the Chandler-Dunbar water-power case, in which the most advanced ideas of federal control have been enunciated. It was decided that if a stream be selected by Congress for the improvement of navigation, the Government may utilize either for itself or for sale or lease the water power created as a part of or in connection with much improvement, as against the owners of the abutting property or of the bed of the stream. In short that the control of the Federal Government in navigable streams is absolute and paramount to all other rights and titles, whether of riparian owners or of individual states.

One feature of the water-power question most imperfectly comprehended by the general public is yet of the most potent significance; that is the electrification of our great transcontinental railways. Railway managers have just awakened to this possibility. Already the electrification of the Chicago, Milwaukee and St. Paul Railway by water power has been announced. It has been estimated that there is water power which can readily be developed in the Northwestern States, sufficient to operate every mile of railway west of a line drawn north and south through the center of the state of Montana and north of a line drawn from the southern boundary of Colorado to the Pacific Coast. This would include a half dozen of the great railway systems and the annual saving in fuel consumed would reach the vast total of $40,000,000.

The only way to gain benefits from our water-power resources is to develop them. We are now deadlocked. The friends of the conservation movement in Congress are strong enough to defeat the efforts of those who seek to put through the unlimited grants of former days. On the other hand, those who believe that Congress ought to continue an absolute policy are strong enough to prevent the enactment of constructive legislation. Water power is now the one great asset of the nation which is running to waste and whose value will not be diminished by use.

THE POINT OF INFERIOR COMMERCIAL EFFICIENCY OF DISTRIBUTING TRANSFORMERS.

By E. D. Dreyfus.

Reckoning universally, the distributing system of the central-station plant has only within the past few years been given the proper economic consideration. The proof appears in the large number of discarded transformers to be found in the storerooms or the "bone yard" of a great many electric light companies.

There have been two causes mainly responsible for this turn of affairs. First, and probably chiefly, is the change in practice of using one large and more economical transformer with an extended secondary circuit to replace groups of small transformers each serving say an individual consumer; and secondly, the improvement made in efficiency and regulation, and better holding-up qualities and design generally.

For these reasons more attention is constantly being given the layout of distributing system and the efficiency of the transformers already in place, the object being a reduction of the shrinkage and waste of the energy delivered to the system. In checking the distribution plant and testing the transformers in use, it is desirable to have a ready guide for determining whether a transformer should be removed, due to its operating efficiency, or allowed to remain in service.

The following data recently prepared will probably be found of value as an addition to the information which has been published on this subject. Curves are employed as they afford a convenient way of applying the average value which should be the basis of any commercial or economic proceeding.

From Fig. 1, we may obtain the reasonable discarding point of distributing transformers ranging from 0.5 to 75 kilowatts. It will be of interest to note the manner in which these curves were developed, as local conditions may introduce different values than here employed.

The basic information is presented in Table I, giving the average of the core losses and prices quoted by three well known transformer manufacturers:

TABLE I.

Size in Kilowatts.	Core Loss in Watts.	Cost of New Transformers.
0.5	16	$ 15.46
1.0	20	19.65
1.5	24	23.68
2.0	29	27.62
2.5	32	30.93
3.0	34	34.53
4.0	39	41.47
5.0	44	47.76
7.5	60	65.04
10.0	76	80.29
15.0	101	110.26
20.0	127	136.99
25.0	143	158.84
30.0	164	183.52
40.0	202	246.36
50.0	240	278.74
75.0	330	325.00

These data apply to the most modern types of transformers and of the three makes taken their respective regulation characteristics were found to be quite comparable. All costs are f. o. b. shipping points and allowances are later made to cover freight. No points have been plotted in the graphs to avoid possible confusion, but it will be observed on checking that the individual points lie very closely to the average curves A and D.

The value of the core losses in dollars depends upon the cost of producing electric energy, which is affected by the character of the power plant and price of fuel obtained.

As production costs vary widely, different values per kilowatt-hour have therefore been included in the chart. The

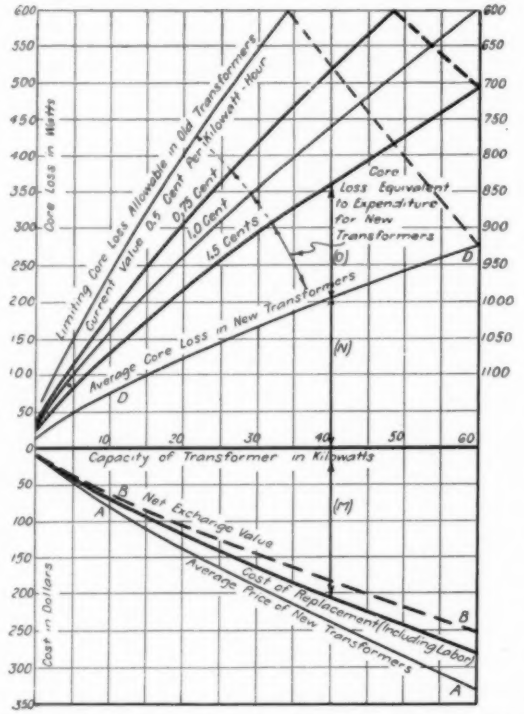

Core Loss in Watts
Limiting Core Loss Allowable in Old Transformers
Current Value 0.5 Cent Per Kilowatt-Hour
0.75 Cent
1.0 Cent
1.5 Cents
Core Loss Equivalent to Expenditure for New Transformers
Average Core Loss in New Transformers
Capacity of Transformer in Kilowatts
Net Exchange Value
Average Price of New Transformers
Cost of Replacement (Including Labor)
Cost in Dollars

Fig. 1.—Limiting Core Loss for Distributing Transformers.

equating of the core losses may be quickly accomplished through the use of diagonal lines as in Fig. 2, and a chart of this kind is, as appreciated by many a great time-saving scheme since only one point must be figured for any current value and the line established by connecting the given point with the origin, and furthermore, points for different current values may be interpolated allowing of the chart being prepared with dispatch; all in line with the present efficiency slogan.

As curve A applies only to the cost of new transformers, the approximate final expense of effecting a replacement of a transformer must be obtained. An exchange consideration is usually made where transformers of the same make are substituted. This rebate, be it so termed, happened to be in this case, in the neighborhood of 25 per cent of the price of the new transformer, and accordingly the reduction has been made in deriving curve B. To this lower net cost must be added freight, haulage and the labor involved in the change, which fairly approximates 12.5 per cent only where work is done in an efficient manner.

The concluding steps are indicated by the following example. Taking the case of a 40-kilowatt transformer, we have a replacement cost of $200 (M) and from Fig. 2 we find a core loss of 152 watts at a charge of 1.5 cents per kilowatt-hour necessary to justify the investment. When superposed upon the core loss of a new 40-kilowatt transformer, 202 watts, this gives a resultant of 354 watts, the point beyond which it would pay to discard the transformer under the assumed conditions.

The value of 1.5 cents per kilowatt-hour is rather the upper limit, as it must be borne in mind that the core loss is constant and thereby produces 100 per cent load-factor on the demand required to supply these losses.

The deflected lines at the top of Fig. 1 have been drawn in this manner, as will be understood, in order to maintain as large a scale as possible on a letter size, cross-section sheet. For values on the curves on the upper half of the sheet which slope from upper left to the lower right corner of the sheet refer to the scale on the right, which it will be noted is a continuation of the left scale, but reversed in direction.

The actual data in Table II, taken at random, typifies the condition fre-

TABLE II.

Test No.	Capacity in Kilowatts.	Core Loss in Watts. Average New.	Core Loss in Watts. From Test
1	2	29	78‡
2	2	29	165‡
3	2	29	119‡
4	1.5	24	102‡
5	4	39	169‡
6	5	44	191‡
7	5	44	206‡
8	2.5	32	32*
9	10	76	102*
10	10	76	101*
11	5	44	49.5*
12	10	76	261‡

* indicates transformers having satisfactory operating efficiency.
‡ represents transformers that have deteriorated in efficiency to point of commercial waste and extravagance.

quently encountered in properties where the engineering and operation of the distributing has not previously been accorded adequate attention.

The above illustrates the second cause for revamping a great many distributing systems and Table III, which is taken from actual results, exemplifies the first cause. The entire group of transformers in Table III was replaced by two 25-kilowatt transformers, with a total loss of 286 watts.

TABLE III.

Test No.	Capacity in Kilowatts.	Core Loss in Watts. Average New.	From Test
13	4	39	116‡
14	3	34	112‡
15	2	29	58*
16	3	34	94‡
17	1	20	25*
18	10	76	75*
19	5	44	55*
20	5	44	55*
21	5	44	54*
22	7.5	60	69*
23	7.5	60	73*
24	10	76	89*
25	10	76	89*
26	7.5	60	73*
27	7.5	60	73*
28	10	76	89*
29	10	76	101*
30	10	76	85*
Totals 114		984	1335

* Serviceable efficiency.
‡ Wasteful.

The cost of the two 25-kilowatt substituting transformers ($319.08) is less than one-third that of eighteen distributed transformers ($989.35) and the core losses about 30 per cent when new, and approximately 20 per cent as found on test. Or viewed from another angle, there is a saving of 1,049 watts or 9,200,000 watt-hours per annum, which at one cent per kilowatt-hour represents a saving of $92, which capitalized at 10 per cent warrants an investment of $920, or nearly three times the cost of the replacing transformers. This is obviously a particular fruitful effect of diversity of the load.

Moreover, the eighteen transformers thus withdrawn from service are, in the main, still economically serviceable as shown by the asterisks, and are to be profitably located in another part of the system where the small sizes may be justified.

The copper required in the secondary circuits is of course greater where the service connections are grouped and supplied by a single transformer, but this is not of particular moment so long as the service connections forming the group are not too seriously scattered.

Much may be said on this important topic, but the foregoing will, it is believed, display the reasons for the rebuilding of many distributing systems which have for one cause or another been neglected.

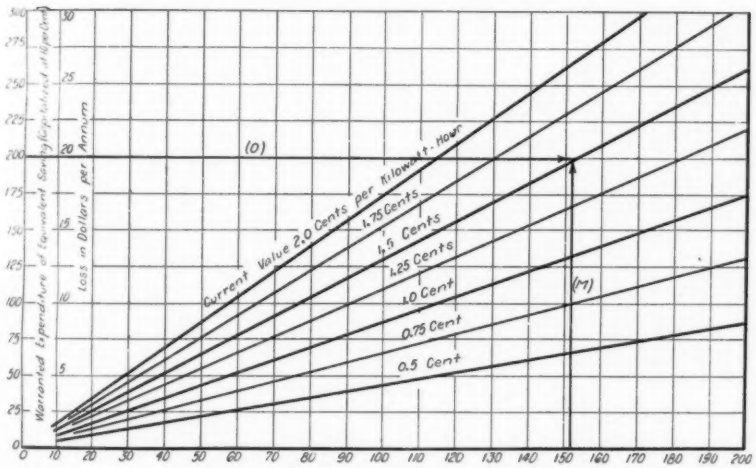


Fig. 2.—Chart for Equating Saving in Core Loss for Different Current Values.

The meeting was called to order at 8:30 p. m. by Chairman D. W. Roper, and Secretary Warder was called upon to read the minutes of the previous meeting and various communications. Mr. Andrus then presented his paper, of which the following is an abstract.

Test of Low-Head Water Turbines.

Mr. Andrus's paper deals with the general methods of testing of three horizontal water turbines designed for low-head service that are installed in the Elkhart hydroelectric plant of the Indiana & Michigan Electric Company. Each of the two main units consist of two pairs of water turbines arranged tandem; these are 50 inches in diameter and of the central-discharge type. When operating under a net working head of 18 feet these units were guaranteed to develop 1,400 horsepower each at full gate opening, using about 51,500 cubic feet of water per minute at a normal speed of 120 revolutions per minute. A smaller unit for the exciter consists of one pair of 26-inch water turbines guaranteed under the same head to develop 170 horsepower and using 6,250 cubic feet of water per minute at a turbine speed of 257 revolutions per minute. These water turbines were furnished by James Leffel & Company. Connected with each of the main units is a 1,000-kilovolt-ampere, three-phase, 4,000-cycle Westinghouse generator; a 100-kilowatt 125-volt exciter was driven by the smaller machine. A special system of lubrication consisting of a large grease compressor fitted with hand wheel and gears was provided; the grease is piped from this compressor to the various bearings of the water wheels. Each of the water-turbine units is equipped with a Lombard horizontal oil-pressure governor, each of these having an oil pump belted to its generator shaft. The amount of water admitted to the water wheels is controlled by water-balanced gates operated from a gate-operating ring. The governors are direct-connected to the gate shaft in such a way that by means of rocker arms and connecting rods the gate shaft can be turned through an angle of 60 degrees without any intermediate gears.

The water turbines were purchased under definite manufacturer's guarantee as to efficiencies and horsepower which the turbines would develop under different operating heads and gate openings. Since the contract under which these machines were purchased provided for a test of the turbines relative to efficiency and power output guaranteed, these tests were undertaken and showed excellent results. The output of the water wheels was guaranteed at the generator end of the unit; therefore, the brake-horsepower output of the wheels was calculated from the electrical output, the efficiency of the generators having been determined from data obtained in tests of these machines at the factory. The theoretical horsepower in the water passing through the turbine was determined by having the discharge water pass over a testing weir carefully constructed according to the Francis design, the weight of this amount of water being multiplied by the net working head and divided by 550. The generator efficiencies were determined from manufacturer's data by the loss method. The test weir was located 172 feet downstream from the discharge end of the turbine draft tubes. This weir was built across the tail race between its two concrete side walls. Since the discharge through the tail race was low when only one unit was in operation and since the weir was a considerable distance from the draft tubes, the discharge over the weir was from a relatively quiet pond. Equalizing pipes were laid in the floor of the tail race to determine the elevation of the water surface above the level of the weir crest. Precautions were taken to have the nappe thoroughly aerated. Various corrections were applied to the weir readings in accordance with standard formulas. The head-water readings of the turbines were taken from the elevation of water standing in large glass tubes in the power house, there being two of these tubes for each turbine penstock. The

tail-water readings are taken from the elevation of water standing in vertical four-inch pipes extending below the water level in the side walls of the discharge end of the draft tubes. The difference between the head-water and tail-water readings was then taken as the true measure of the net head of water under which the turbines were operating.

The test on each of the units consisted of several runs, each covering a period of at least 15 minutes in order to insure stable conditions. During each run readings were taken at intervals of one minute. A different adjustment of load was made for each run. A water rheostat was used as load for the generators. For each run there was determined the maximum discharge from the turbines at maximum efficiency. This was found by starting with full gate opening and adjusting the electrical load to bring the turbine to the speed under which the guarantees were to be verified. By accurately closing the gates and carefully observing the electrical instruments to measure the output, the point was readily determined at which the electrical output began to decrease as the turbine gates were being closed. The gate opening at the operating condition immediately preceding the decrease in electrical output is the gate opening at which the maximum efficiency at maximum discharge is realized. The flow for this condition was determined by the test weir.

About 25 observers were used in taking the readings at different stations. These had been carefully instructed on precautions to be observed in reading their instruments and in recording their data. A code of electric bell signals was used to insure taking readings at identically the same time. A messenger was also employed to bring to the desk of the engineer in charge a summary of the recorded data obtained for each particular run from each observation station.

From these records running checks were readily established as to the prevailing condition of the test. These checks were available within five or ten minutes after each run was completed.

Mr. Andrus pointed out that it is seldom that low-head water-power plants present any commercial advantage over steam plants. The average cost of development is $250 per kilowatt, which entails a fixed yearly charge of $25. To this must be added $4.00 for attendance, which brings the yearly cost per kilowatt to $29. For a steam plant the average installation cost is $100 per kilowatt, entailing a fixed charge of $15. With $15 for operating costs there is a total of about $30. It is only where load conditions are suitable that the water-power plant possesses any marked advantages, but it is often necessary to undertake the development in order to prevent such developments by competing parties. He showed that the necessary losses in water-power development ranged from 17 to 27 per cent, making it impossible to secure an efficiency of much over 83 per cent. The best one of the units tested, however, had, under the most favorable conditions, an efficiency slightly above this figure.

Written discussion of the paper was submitted by R. L. Sackett and James C. Pinney, Jr. This discussion commented upon the importance of the paper and went into the details of weir measurements.

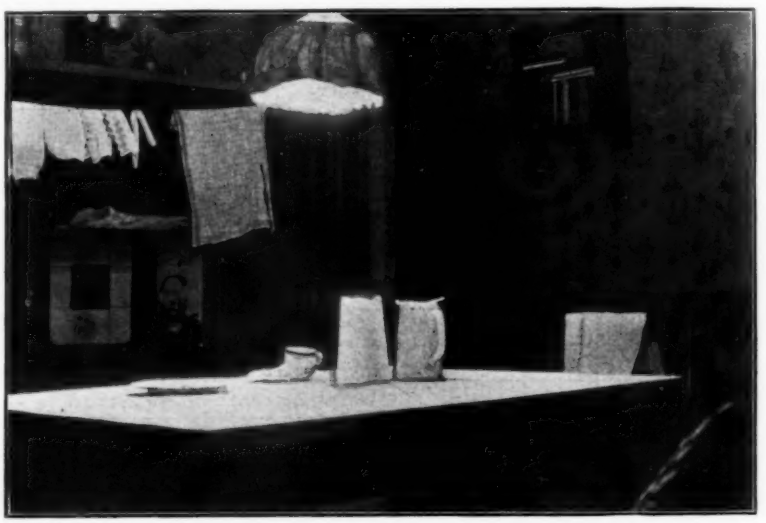
William B. Jackson pointed out that many water-power projects were not commercially successful and in some cases the rates were not figured from the actual costs but from the cost of operating an equivalent steam plant. Where the market is such that a steam plant can take the short-hour load while the water-power plant takes the continuous load, and at low-water period the water-power plant takes the peak only while the steam plant takes the continuous load, the water-power plant may be commercially successful and very valuable. The great development of water wheels has been due to their use in connection with electrical generators and transmission lines, and to the possibility of measuring the output electrically. The plant described by Mr. Andrus is probably the most efficient low-head plant in the country, but there may be more efficient plants in Europe, where more attention has been devoted to design. The efficiency attained in the Elkhart plant is within 1.5 per cent of that of a large plant recently installed with a 300-foot head.

M. G. Lloyd commented upon the method of determining load losses in the electrical generator and pointed out that the present standardization rule of the American Institute of Electrical Engineers covering this point is likely to be altered in the revision now in progress. While most electrical measurements can be made accurately and form the best means of determining the output of prime movers, this particular item is difficult to determine, but as it is small it has little effect upon the measured efficiency of the prime mover.

F. G. Vent inquired as to whether the turbines at the Berrien Springs plant had also been tested.

In reply Mr. Andrus stated that the United States Government publication on weirs had been followed in making corrections to those measurements. He stated that European turbines were usually more efficient and pointed out how efficiency could be improved by the proper shaping of the wheel, buckets, draft tubes, etc., for each particular case. In this country it is more common to use stock designs, which are likely to be less efficient but introduce a saving in initial cost. Some tests had been started at Berrien Springs but these were not satisfactory and the runs are to be repeated in order to obtain reliable results. The Standardization Rules of the American Institute of Electrical Engineers had not been followed in determining the load losses, as indicated in the paper, but one-tenth of the armature copper loss had been used for this purpose.

Before adjourning the meeting passed a vote of thanks to Mr. Andrus for his presentation of the paper.



Impromptu Light Screen in Kitchen.

Illuminating Engineering in the Kitchen.

Under this title *The Illuminating Engineer* (London) gives an interesting instance of common sense in arranging kitchen lighting. The picture shows a kitchen lighted by an ordinary shal-

low opal shade over which the servant, of her own initiative, has placed a cotton covering so as to screen the light from the eye. The outer covering is of green cotton, but it is lined with white so as to reflect the light downwards.

This shows how, by a quite simple adaptation, an unsatisfactory form of shade can be vastly improved. But it also shows that many of the shallow shades in use today, which do not screen the filament from the eyes and only direct a small part of the light downwards, are found to be a nuisance.

Denver and Rio Grande Electrification.

Newspaper dispatches report an announcement in Denver by B. F. Bush, president of the Denver and Rio Grande Railroad, that the electrification of that road will be inaugurated over the entire line between Grand Junction, Colo., and Salt Lake City, Utah. The first announcement of this electrification, made about one year ago, contemplated electrification at the start of only two sections—those including Soldier Summit in Utah and Tennessee Pass in Colorado. The portion of the road now included in the electrification plan covers a distance of 325 miles.

Aeroplane to Patrol Lines.

According to newspaper dispatches from San Francisco, Cal., Robert Fowler, an aviator, has announced that he has signed a contract with a power company to patrol its lines between Oakland and Oroville and will make trips twice weekly, beginning November 20.

Because of difficulty in locating broken wires and interrupted power service, the power company hit upon the idea of employing an aeroplane and aviator, and when Fowler demonstrated that the plan was feasible a contract was signed.

A Stassano Electric Furnace in Southern California.

There has recently been installed in the Warman steel plant at Redondo Beach, in Southern California, a Stassano electric furnace, and the smelting operation which formerly occupied eight hours, when oil was employed as fuel, is now accomplished by means of this electric furnace in five hours.

The furnace was installed under the personal supervision of Ernest W. Schmelz, the American representative of the Stassano system, who described the construction of the furnace and its many advantages for the production of high-grade steel at a recent meeting of the Los Angeles Section of the American Institute of Electrical Engineers.

According to Mr. Schmelz, the Stassano furnace was the result of a patriotic impulse born in the mind of Ernesto Stassano, of Turin, Italy, who realized that his country had plenty of excellent iron ore but no coke which could be used as fuel for smelting purposes, and must rely on its abundant water power for the production of electric current to operate its furnaces and thus be in a position to cast its own guns, as well as other articles of steel, used by the various branches of the government.

Major Stassano's first furnace was set up 15 years ago, in the town of Darfo, Upper Italy, for the production of steel from iron ore by a direct process, which at that time was not considered a feasible proposition. This furnace had the appearance of an ordinary blast furnace, with water-jacketed holes at the sides for the electrodes to pass through. This furnace was successful as far as the production of steel directly from ore was concerned, but was a financial failure in view of the limited subsidy granted by the Italian Government.

The design was then changed to resemble the ordinary open-hearth furnace, and the first furnace of this type was installed in 1904 at the Artillery Arsenal at Turin for the Italian Government. This furnace, which is still in successful operation, uses three-phase current, has three electrodes and was of the rotating type, a construction which has since been abandoned. The furnace capacity was 1,800 pounds; it consumed about 150 kilowatts and was operated at about 100 volts.

The modern Stassano furnace, which is of the same general design as the one first described, and which is shown diagramatically in Fig. 1, differs from the older types in that the mixing of the molten metal is effected by what might be termed an oscillatory motion of the entire furnace. This is produced by revolving the lower portion of the drum by an electric motor to which it is coupled by means of bevel gears through the medium of a large ball revolving about the shaft of one of the gears. This flexible connection is essential because the entire drum is suspended by means of trunnions in a ring which surrounds it at the center, which in turn is supported at an angle of 90 degrees from this suspension by trunnions in bearings, which are a part of the main supports of the furnace. It will thus be seen that, while the lower portion of the drum rotates, the central and upper portions have only an oscillatory movment, on account of this double suspension, similar to that of a ship's compass. The mixing of the bath, which is situated within the central portion of the drum is thus efficiently accomplished in this furnace without the necessity of opening the furnace doors.

The advantage of imparting a motion to the bath, for the three-fold purpose of producing uniformity of the mixture, increasing the activity of the slag by bringing new particles of steel in contact with it and causing gas inclosures to free themselves and rise to the surface, at periodic intervals

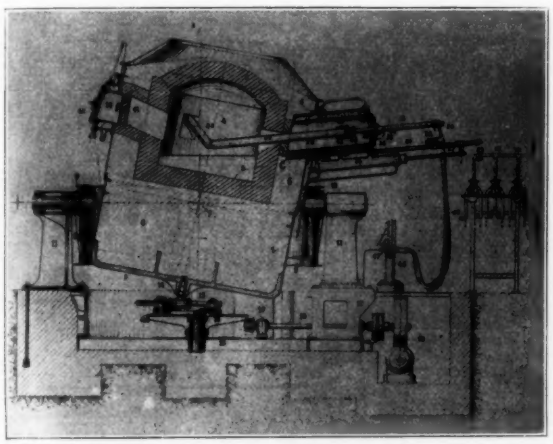


Fig. 1.—Sectional View of Stassano Furnace.

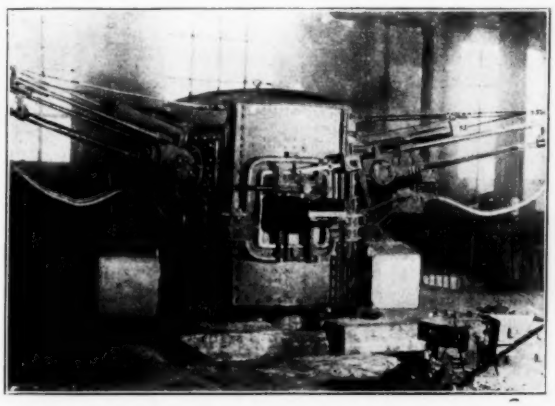


Fig. 2.—Stassano Furnace in Arsenal at Turin.

only is a unique feature of the Stassano furnace.

The carbon electrodes which are 4 inches in diameter and 5 feet in length enter the drum in an inclined direction at a convenient height above the ground to be easy of access. Three electrodes are required when three-phase current is used and two for single-phase or direct current, another advantage of the furnace being that either alternating or direct current can be employed.

The electrodes are water-cooled and are operated by hydraulic pressure from a distance. The openings through which their supports pass are tightly closed. This method of construction insures considerable economy by not permittng the heat to escape, as is the case with arc furnaces in which the electrodes enter at the top.

The three carbon electrodes in a three-phase furnace are controlled separately, as stated above, by an attendant by means of three levers, each operating one hydraulic cylinder forming a part of each electrode, and are adjusted to the required distance from one another to form the arc, by the operator watching the indications of the three ammeters, one being connected to each phase. After a little practice he can so control the movement of the electrode as to insure an absolute balancing of the load on the three phases.

The arc playing some distance above the molten metal but never coming in contact with it prevents the deterioration of the metal by not imparting to it the impurities of the carbons, which is another advantage of this type of furnace over others in which the arc plays directly into the mass of metal.

The material to be melted is fed to the furnace proper, the walls of which are lined with magnesite bricks, through an opening at the side of the drum and the molten metal is poured into ladles by tipping the entire drum. Scrap steel or iron but no pig iron is used for the production of steel of any desired composition and the same can be refined to any desired degree by the addition of a quantity of high-quality alloys, oxidation of the carbon and phosphorus being effected by the addition of rolling-mill scale or ore, while the elimination of sulphur is accomplished by the addition of lime.

To insure economy it is advisable to operate the furnace continuously, for it is necessary to keep the furnace walls hot after the first heating, as the magnesite bricks will crack when allowed to cool and the current used for keeping the walls hot would be wasted, unless employed also for the purpose of smelting.

It may be of interest to present figures showing the cost of operation of a one-ton Stassano furnace capable of producing five tons of metal during a 24-hour period in five heats.

The furnace, inclusive of its foundation, water and current connection and engineering service, costs about $3,500. Figuring 6 per cent for interest and 6 per cent for depreciation, this yearly expense would amount to $420. Assuming the furnace to be in service 240 days per year, producing 1,020 tons of steel, the interest and depreciation charges amount to 42 cents per ton.

It takes 1,000 magnesite bricks for one lining at $130 per 1,000 and the labor of lining amounts to $30, a total of $160. As a lining is good for about 80 heats, the cost of lining per ton is $2.00. It requires two men to operate the furnace, one at, say 40 cents per hour and the other at 30 cents, a total labor charge of 70 cents per hour, which, for a five-hour run amounts to $3.50 per ton.

The scrap used for melting, at $10.00 per ton and figuring a two per cent loss, costs $10.20 per ton. The alloys, such as ferro-manganese and ferro-silicon, cost about $1.00 per ton of metal to be melted.

The electrodes, figuring 96 pounds for a 24-hour run of five tons, cost 96 cents.

The cost of power brings the total cost of production of one ton of steel up to $27.08. If, however, the furnace is operated for three heats per day instead of five, the cost per ton, in view of the cost of current required for keepting the furnace hot, as pointed out above, will be increased to $32.05 per ton. This is exceedingly low, when one considers that crucible foundries usually figure on a cost of from $60 to $100 per ton.

Summarizing the advantages of the Stassano furnace, we may enumerate them under the following heads: melting of metal in a neutral atmosphere; transformation of electrical energy into heat at the highest possible temperature; simple shape of surface of melting chamber; ease of control of mixing operation; adaptability to any voltage, current and number of cycles; simple and safe regulation for heating the furnace and oscillating the drum; simple and strong construction of the furnace; low cost of installation and operation; high factor of efficiency by continuous operation; low furnace loss; adaptability of one type of furnace to various foundry operations.

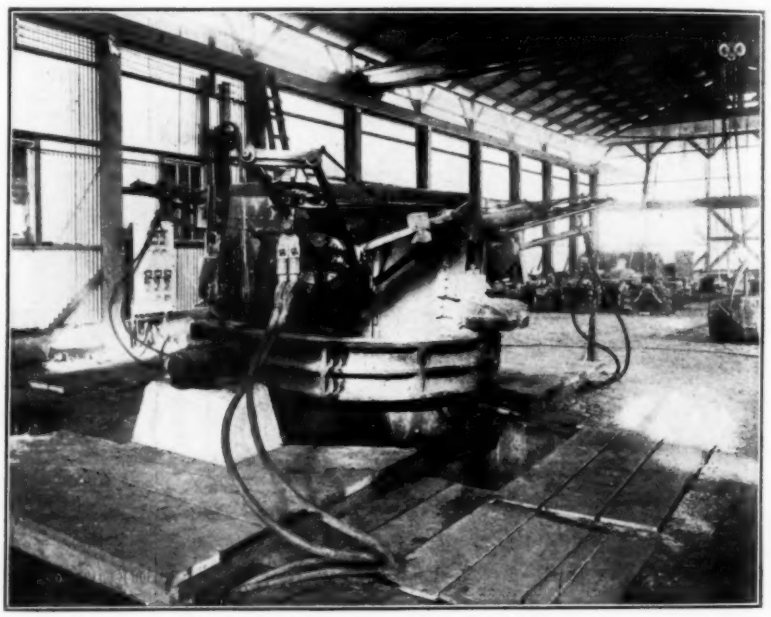


Fig. 3.—Stassano Furnace in Warman Steel Plant.

Large Alternating-Current Generator Installed.

A 20,000-kilowatt turbogenerator of the horizontal type has been placed in operation in the power house of the Public Service Electric Company at Marion, N. J. It will furnish three-phase current at 60 cycles and 13,200 volts.

This unit is 40 feet long, 15 feet wide, and 9 feet 6 inches high, and weighs 682,000 pounds. The condensers are mounted underneath the generator and consist of two sections containing 6,000 tubes. Each tube is 17 feet long and one inch in diameter. The cooling surface is 25,000 square feet, and 37,500 gallons per minute of water will be used for cooling.

New Electrical and Mechanical Appliances

Ensign Electric Calculating Machine.

In the display windows of the New York Edison Company there was recently shown an electric calculating machine which multiplies, adds, divides and substracts. This machine was also one of the features of the New York Electrical Show.

This is an office current-consuming device which acts as quick as thought. It will not only add and multiply as fast as electricity but division and subtraction for all manner of office and factory cost-accounting work and technical calculations are its normal functions. The operator merely presses the keys and buttons, the machine does the rest.

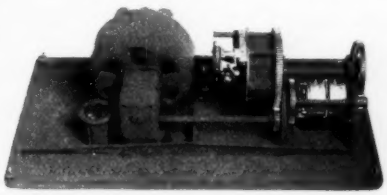
Ensign Electric Calculating Machine.

This machine is made by the Ensign Manufacturing Company, Boston, Mass., and its sales manager, Zenas W. Carter, says: "'Figure it electrically' is already the slogan in the offices of the New York Edison Company, the Philadelphia Electric Company, Stone & Webster and Henry L. Doherty & Company, where from one to four of these machines are in daily use."

The performance of this machine is fascinating and the electric drive is very ingenious. A one-twelfth horsepower Holtzer-Cabot motor furnishes the power. This motor winds a large spring by a worm gear and shaft connection. The tension of the spring must be constant and the wind is slow. This slow winding is accomplished by the twenty to one reduction of the worm gear and the further reduction by means of a small pinion in the circular spring box, as is shown by the illustration herewith. The operating device is so arranged that the motor will wind the spring while the calculating mechanism of the machine is unwinding.

The motor is controlled by means of a specially designed type of snap switch which cuts out when the spring reaches a predetermined tension. It also cuts in again when the spring is partially unwound. This makes an automatic cutoff, so that the motor cannot be left running. It stops before the operator leaves the machine.

To further regulate and control the actual working speed of the machine a centrifugal type of governor of unique design is connected with the shaft. This regulates the action of the machine by merely increasing or decreasing the weight of the metal wings. All shafts and bearings are of roller type, hardened and polished, thus reducing friction to a minimum.



Motor Drive for Calculating Machine.

The Ensign Company markets its machine on a 30 days' trial basis and guarantees it for three years. The ingenious electrical drive eliminates the need for turning a crank, or throwing a lever; thus it decreases to a minimum the labor of operations and thereby increases the speed of the operator. It also prevents the violent jars, jerks and strains to which the manually operated machines are subjected.

Pole-Top Switches for 33,000 Volts.

The increasing use of high-tension pole-top switches during the past two years has developed a demand for information as to methods of mounting such equipment on existing poles. The installation shown herewith will therefore be of interest to central-station managers and engineers.

It will be noted that standard 10-foot cross-arms are used to support the channel-iron bases on which the switching elements are mounted, the three single-pole units being mechanically interlocked, thus operating simultaneously. The operating rod extending down the pole is provided with a handle which can be locked in either open or closed position as desired. With this type of equipment the circuits can be opened under full-load conditions, the arc being ruptured on magnetic blowout discharging horns.

The contacts and operating mechanism are so designed that the switch cannot freeze, thus permitting its operation under the worst winter conditions. This simple, inexpensive high-tension switch has a wide application for use in connection with outdoor substations and is manufactured by the Delta-Star Electric Company, Chicago, Ill.

33,000-Volt Pole-Top Switches.

A Three-Phase Rectifier of the Rotary Type.

An interesting apparatus which has recently been placed on the market by the Siemens-Schuckertwerke, is designed for the purpose of converting three-phase currents into direct current for use in connection with small arc lamps, moving-picture work, the charging of electric automobile batteries and similar purposes. It is of the

rotary type and is built in sizes up to six kilovolt-amperes. The normal output of the apparatus on the direct-current side is 50 amperes at 80 to 130 volts, this is capable in automobile charging for dealing with 40 to 44 cells in series. The apparatus can be used for smaller but not for higher voltages and the primary coils of the transformer are wound either for 120, 220 or 500 volts at a frequency of 50 cycles. The advantage of this apparatus over a motor-generator is found in high efficiency. In the motor-generator the usual efficiency which is possible is in the neighborhood of 70 per cent while it has been shown in the apparatus considered that an efficiency of 85 to 90 per cent can be obtained.

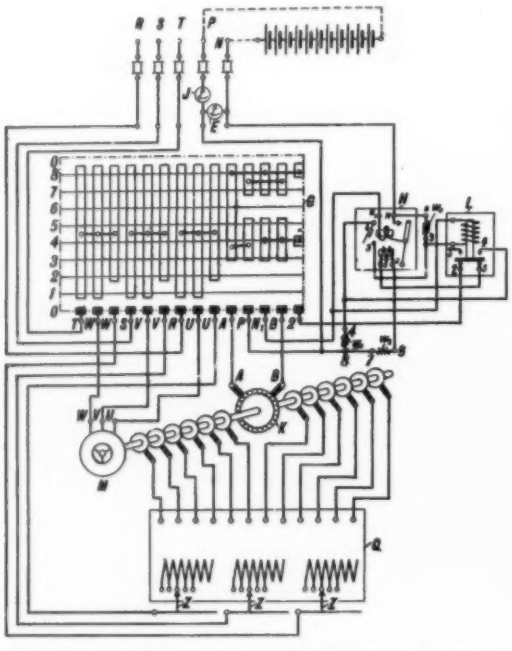


Fig. 1.—Connections of Three-Phase Rotary Rectifier.

Fig. 2.—Siemens Three-Phase Rotary Rectifier Outfit.

Referring to Fig. 1, the rotary rectifier consists of a transformer Q and a collector K with fixed brushes which is operated by a synchronous motor M with four poles. A controller G with a relay L for safeguarding the insertion of the rectifier in correct polarity is provided. The transformer is of the ordinary three-phase type. The three windings are brought out to a three-pole switch, each phase of which is furnished with multiple contacts any of which can be connected to the three-phase supply system. In this way the number of primary turns can be varied and consequently the secondary voltage, and therefore the rectified direct-current pressure can be adjusted. The secondary winding of the transformer is arranged so that a 12-phase current can be obtained. Twelve slip rings carry this 12-phase current to the 24-contact collector K. This collector is so arranged that one of the 12 slip rings mounted on the same shaft as the collector is in circuit with a pair of segments. The stator of the synchronous four-volt motor driving these collector rings and the commutator K is connected to the three-phase supply. No synchronizing gear is required, as the motor is started by means of the drum controller and falls into synchronism automatically. The motor runs at 1,500 revolutions per minute on a frequency of 50 cycles. Each revolution of the motor and commutator connected to it corresponds to two periods and the brushes AB are therefore set at right angles to each other. They give off a direct current between light load and full load. It is possible to give a slight rocking adjustment to the brushes but this is hardly ever necessary.

The controller G is used for starting the motor, switching and polarizing the apparatus. In its open-circuit position, all the circuits are interrupted, but in the position marked 1 in the diagram the motor M is put into connection with the supply and begins to turn. It is possible, of course, for the direction to be right-handed or left-handed, and if it is not running in the proper direction the connections of two of the supply wires are changed over. In the second position the primaries of the transformers are connected to the supply mains and continuous or rectified current is given at the brushes A and B. Adjustment can be made by the contacts Z to give the proper pressure for the working current and when the controller is brought over to the point 3, the battery to be charged is connected up. It will be noted, however, that the device H is interposed in the battery circuit and until H is closed the circuit is not complete. Supposing that the polarity of A and B is in the wrong direction, the relay L acts and prevents the closing of H at position 4. If the polarity is correct, the battery circuit is closed and the charging is commenced. The rate of charge can be regulated by varying the contacts at Z.

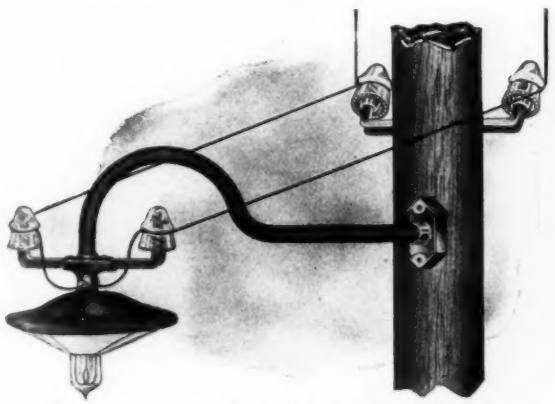
Fig 2 shows photographically the appearance of the apparatus. It will be seen that the transformer is contained in a casing closed in by expanded metal so as to give air circulation. On the top of this casing is mounted the motor and collecting device together with the five terminals connecting the apparatus up to the external circuits.

The relay apparatus is included inside the case. The necessary ammeter and voltmeter indications are given upon edgewise instruments mounted on a pedestal above the motor frame. Owing to the subdivision of the secondary circuit into 12 phases, the rectified current is subject to extremely small pulsations and very closely approximates the ordinary direct current. In practice the apparatus is most simple to operate even by comparatively inexperienced attendants which is therefore a valuable feature. For purposes such as above described requiring a direct current in areas where the power supply is from an alternating-current sys-

tem, the apparatus presents many advantages which will be duly appreciated. We are indebted to Siemens Brothers Dynamo Works, Limited, of Westminster, London, England, for the above information.

Ky-Ce-Lain, a New White Reflecting Enamel for Outdoor Lighting Fixtures.

The reflecting surface of outdoor or street lighting fixtures is of considerable importance. To make this surface efficient and durable is the aim of all makers of such fixtures. The Line Material Company, of South Milwaukee, Wis., maker of the Kyle line of outdoor lighting brackets and fixtures, has in the past treated its japaned reflectors with a triple coating of white japan which was baked after each coating. Although this has provided a satisfactory and durable reflecting surface, experiments which have been carried on for some time by the company have resulted in the discovery of a still better reflecting surface, known as "Ky-Ce-Lain." This has in addition the good feature of costing no more than the old, less efficient finish.



Outdoor Fixture With Ky-Ce-Lain Reflecting Surface.

The ordinary method of applying japan enamel is by dipping or painting, but the new Ky-Ce-Lain white reflecting surface is put on by a secret process. This surface becomes a hard glossy vitreous coating, as smooth as glass and which retains its reflecting efficiency indefinitely. Tests have also shown that this surface is not affected by bending, although this quality is not a necessary one in reflector construction.

In the accompanying illustration is shown a Kyle fixture, the reflector of which is of the type that is now furnished with the new white reflecting surface. The upper surface, as heretofore, is furnished with a rich velvet-appearing black-blue enamel having a special weatherproof coating. The standard fluted type of reflectors used on many styles of fixtures will be porcelain-enameled as before.

Peerless Improved Fault Finder.

Great advances have been made in instruments for facilitating the location of faults, crosses and opens on telephone and telegraph lines. An instrument that embodies the latest developments in this line is what is known as the Peerless improved fault finder made by the Thompson-Levering Company, 323 Arch Street, Philadelphia, Pa. This instrument is useful not only for the purposes mentioned, but also for measuring insulation resistance and conductor resistance in such circuits. In principle it is a modified form of circular slide-wire bridge made in such a way as to condense into a compact and accurate apparatus the equivalent of a very long slide wire.

Peerless Improved Fault-Finder Set.

A general view of the instrument is shown in the accompanying illustration. The resistance adjustment is shown at the right. It includes a circular scale which is said to be accurate to within one-half of one per cent; the divisions of this scale have been carefully calibrated by hand for each particular instrument and then the scales engine-divided in accordance with this calibration. Divisions are of uniform length throughout the entire length of the scale and are clearly marked in with black lines. Both ends of the scale are equally accurate, an advantage not usually found in similar instruments. It is possible to estimate easily to one-fifth of a scale division. The adjusting handle in the center of the scale contains a unique feature in having incorporated in it the battery contact. The handle is so arranged that while the middle finger and thumb are used for turning the resistance-dial indicator, the index finger can be used for tapping the battery contact key at any time; this allows complete freedom to the tester to use the other end for recording data or any other purpose.

Included in the set is a galvanometer of unique form, shown in the illustration in the lower left-hand corner. The moving system of this galvanometer is extremely light and it is mounted in such a way as practically to eliminate all pivot and jewel troubles. This allows the instrument to be handled quite roughly without damage to the moving element or its mounting. The jewels used in the bearings are of the highest grade sapphire.

A convenient type of bridge switch is provided for readily showing the multiplier to be used in connection with the dial reading. Thus, when this switch is turned to 10 the unknown resistance is equal to 10 times the dial reading. When the bridge switch is turned to 0.1 the unknown equals one-tenth of the dial reading. By turning the switch to M 100 or M 1,000 in making Murray loop tests, this indicates that 100 or 1,000 ohms respectively is the value of *b* in the Murray-loop equation. A unique switch is also provided for conveniently changing the connections for making either the Murray-loop test or the Varley-loop test; thus by turning this switch to the type of test desired all internal connections are instantly arranged for this particular test. A switch marked *BA*

and having on one side 0 and on the other side 9,000 is provided for conveniently throwing 9,000 ohms in series with the circuit, so as to protect the instrument from excessive current in making preliminary tests; when an approximate balance is obtained the switch is turned to 0 and the final adjustment then made.

This test set is mounted in a case of oak protected by nickel-plated brass corner clips. It has a lock and a leather carrying handle. Rubber feet are provided both on the bottom and on the back of the box. A sole-leather carrying case provided with shoulder straps can be obtained for carrying the instrument about when tests are to be made outside of the test room. All exposed metal parts are of solid brass finished with gold lacquer. All binding posts are of the double-grip type, making it possible to clamp any size of wire securely.

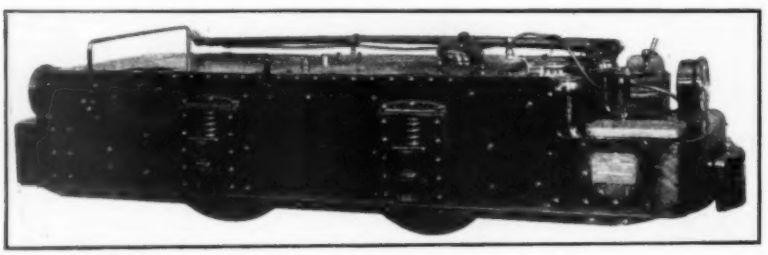
Pioneer Electric Mining Locomotives in Alaska.

What are claimed to be the first electric locomotives ever used in Alaska were placed in service within the past few months for mining operations by the Alaska Treadwell Gold Mining Company, at Treadwell, Alaska. This company was organied for the purpose of taking over the Paris mine and reduction works at Douglas Island, which had been operated since 1882 by the Alaska Mill & Mining Company. The mine is an immense low-grade ore proposition, the property being equipped with two mills having a total capacity of 540 stamps, power plants, foundry, cyanide plant, machine shop, saw mill, central hoisting and crushing plant, etc., practically all of which are either operated by electric power or being equipped for electric drive.

The two initial electric mining locomotives are each of six-ton weight and are operated on a 500-volt direct-current circuit from an overhead trolley. They were manufactured by the General Electric Company and are of the standard outside-frame type. Each machine is equipped with two type H. M.-801 motors having ball-bearing armatures. The motors are mounted in tandem, whereby one motor is located in front of the rear axle and the other between the forward axle and the front end frame.

The motors are of the usual series type and the controller is of the rheostatic, magnetic-blowout type. A commutating switch is incorporated in the reverse cylinder, the handle of which has four "on" positions, two for each direction of motion, one with the motors in series and the other with the motors in multiple. This system of control, by permitting the motors to be started in multiple, allows them to exert their maximum tractive effort independently, so that the slippage of one motor does not affect the other. With the series connections economy in current consumption is effected while running, for the locomotive will then develop a given drawbar pull with one-half the current required with the motors in multiple, the speed, of course, being reduced in approximately the same ratio.

mines at Treadwell are nearly 1 000 miles north of Seattle, Wash. The locomotives are operated on the track leading from the central shaft house to the various mills and haul ore trains composed of ten or more trailers, aggregating a gross trailing load of some 80 tons.



First Electric Mining Locomotive for Alaska.

The Melting Points of Some Commercial Copper Alloys.

As very little information on the melting points of commercial brasses and bronzes can be found in either scientific or technical literature, tests of a few typical alloys were made by H. W. Gillett and A. B. Norton of the United States Bureau of Mines and published in Technical Paper No. 60. The results, summarized, are as follows:

Alloy.	Approximate Composition in Per Cent. Copper.	Zinc.	Tin.	Lead.	Melting Point in Degrees Centigrade.	Fahrenheit.
Gun metal	88	2	10	..	995	1825
Leaded gun metal	85.5	2	9.5	3	980	1795
Red brass	85	5	5	5	970	1780
Low-grade red brass	82	10	3	5	980	1795
Leaded bronze	80	..	10	10	945	1735
Bronze with zinc	85	5	10	..	980	1795
Half-yellow-half-red	75	20	2	3	920	1690
Cast yellow brass	67	31	..	2	895	1645
Naval brass	61.5	37	1.5	..	855	1570
Manganese bronze	..	..	..	..	870	1600

The melting point given is the point where the alloy is completely molten. The temperatures are thought to be accurate within 10 degrees Centigrade.

Unique Shipping Crate for Duraduct.

In shipping materials it is important not only to see that the proper quantity and kind of product is being sent, but also that it is sent in such a manner as to be received in perfect order and intact for immediate use. Particularly is this true when a material is being shipped which is more or less unwieldly and, therefore, likely to suffer during its transportation. This has been appreciated by the Tubular Woven Fabric Company, of Pawtucket, R. I., manufacturer of Duraduct, the well known non-metallic flexible conduit. This company has adopted as it standard shipping crate a form shown in the accompanying illustration. It will be observed that the ends are well protected and the entire arrangement is such as to give the shipment a very convenient barrel form. This greatly facilitates handling the material and makes it occupy a minimum space. These features apply not only in shipping from factory to the purchaser, but likewise in shipping from his stock room to the particular job where the Duraduct is to be used. This material is handled through A. Hall Berry, 97 Warren Street, New York City, general sales agent for the company.

Duraduct Shipping Crate.

Diesel Engines to Be Manufactured by Well Known Engine Builders, the McIntosh & Seymour Corporation.

An announcement has just been made of considerable interest and importance in industrial and engineering affairs. A corporation has been formed with a New York State charter to engage in the manufacture on an extensive scale of a full line of Diesel engines, both stationary and marine. The company will be backed not only by strong American interests, but also to a large extent by Swedish capitalists, who now control the Swedish Diesel Motor Company (Aktiebolaget Diesels Motorer). This company is known all over the world as one of the largest and most successful concerns devoted entirely to the manufacture of Diesel engines. These engines are built on the "Hesselman" system.

The new corporation will take over the plant and organization of the McIntosh & Seymour Company, of Auburn, N. Y., well known as builders of steam engines of the highest grade. The present steam engine business will also be continued as heretofore.

The name of the new corporation is McIntosh & Seymour Corporation. The board of directors is as follows:

Marcus Wallenberg, president, Stockholms Enskilda Bank, Stockholm, Sweden.

Frank A. Vanderlip, president, National City Bank, New York.

Thatcher M. Brown, Brown Brothers & Company, New York.

Edwin S. Church, Auburn, N. Y.

J. A. Seymour, Auburn, N. Y.

Franklin B. Kirkbride, New York City.

Oscar Lamm, Stockholm, Sweden.

Philip W. Henry, New York City.

The general counsel is W. M. Coleman of New York City. Edwin S. Church, formerly superintendent of the Akron plant, International Harvester Company, will be executive head of the new corporation. J. A. Seymour, president of the McIntosh & Seymour Company, will be vice-president in charge of engineering.

The initial capitalization will be $2,200,000, half common and half six-per-cent cumulative and participating preferred stock.

The Swedish Diesel Motor Company started building these engines in 1898. Many of its designs of the most important features peculiar to the Diesel engine, such as the fuel pump, the atomizer, details of pistons, etc., have been purchased and adopted by many other leading builders of Diesel engines in Europe. Its chief engineer, K. Jonas E. Hesselman, although still a young man, has been knighted in Sweden in recognition of his distinguished achievements in this line.

The McIntosh & Seymour Company in the past has run its plant night and day for many years, in the face of severe competition, with the most successful results. Its engines are installed in many of the larger and most successful steam plants in the country, besides which a large export business has been carried on to all parts of the world. Its engines have made many notable records for economy, durability and small cost of maintenance, and its product has always stood for the very best in workmanship and design.

Most of the important European manufacturers of large steam and gas engines are practically concentrating their energies on building Diesel engines, and have such a large number of orders that it takes them from one to two years to make deliveries.

It should be remembered that notwithstanding the increase in the price of fuel oil, the actual cost of fuel oil and its relative cost, as compared with coal, is generally much lower in the United States than in Europe. Also that oil suitable for Diesel engines is a by-product which will always be available in ample quantities as long as the present large consumption of gasoline and kerosene exists. Many large new oil fields are also being developed in this country and other American countries.

Not only do Diesel engines offer many advantages for central-station units, factory and other isolated power plants, and railway service, but are particularly desirable for marine work where weight and space saved is of prime importance. The Diesel oil engine eliminates the boilers with their necessary handling of coal and ashes; also pumps, and many other accessories characteristic of steam equipment. The space so saved, and the coal-bunker space, can be used for cargo, and the liquid fuel handled by pumps, and requiring less than one-third of the room required for coal, can be stored in the ship's double bottom.

In view of these facts, there seems to be no reason why there should not be a broad field in this country for this type of engine, especially when constructed under such exceptional conditions of experience and organization as prevail in a plant like that of the McIntosh & Seymour corporation.

In addition to furnishing exclusive licenses for their valuable patents for the western hemisphere, the Swedish interests in the new American company insure their active aid and co-operation by furnishing a large part of the working capital, and, furthermore, will take an active part in the actual building of the American engines.

The McIntosh & Seymour Corporation thoroughly understands American conditions of manufacture and will produce an output suitable for American needs, as well as furnish a highly developed plant and organization adapted for the immediate production of Diesel engines on a large scale. All of this, with the strong financial backing available assures the success of the new enterprise.

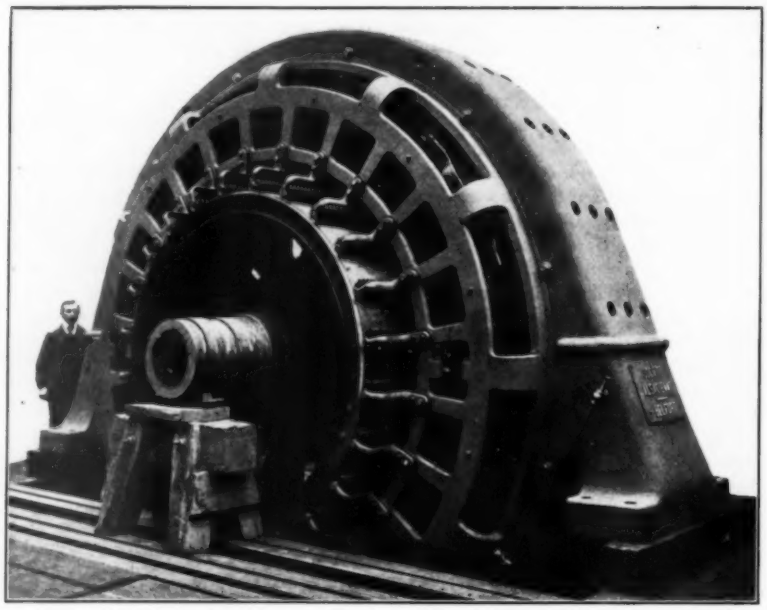
Mr. Wallenberg, the principal stockholder of the Swedish Diesel Motor Company, and Mr. Hesselman, its chief engineer, have been in this country investigating the general situation, and also the sizes and speeds desirable to conform to American standards and conditions.

New 4,400-Kilowatt Direct-Current Generator.

On the next page is shown an exceptionally large direct-current generator, which is the production of a leading French electrical works and, according to our French correspondent, is claimed to be the largest machine of its kind in the world. As concerns the construction of alternators, and especially those which are designed for operation by steam turbines, there are in use at the present time sizes up to 20,000 kilowatts, and some of the prominent builders are now working up projects for alternators to go as high as 30,000 kilowatts. However, direct-current generators have not kept pace with alternators as regards size, on account of great difficulties of construction after a certain point is reached, this being due chiefly to questions regarding commutation. Up to the present it appeared that American manufacturers had the lead in the way of direct-current generators.

The machine shown has just been completed at the works of one of the best known construction firms in France, the Société Alsacienne de Constructions Mécaniques, of Belfort. It is designed for no less than 4,400 kilowatts standard rating. This great machine is to be erected in the near future in the already large station now operating at the Hongway steel works in the northeast part of France, lying in a very active industrial region. Current from this station is used throughout the extensive works for lighting and power.

The present generator is designed to work on the three-wire system, with a potential of 480 volts between outside wires. It furnishes a current of 9,170 amperes total, and operates at a speed of 94 revolutions per minute.



4,400-Kilowatt Direct-Current Generator.

The field contains 24 shunt-excited poles and good commutation is secured by the use of auxiliary poles with commutating winding. The total overall diameter of the machine is 5.22 meters (17 feet 5 inches) while the armature measures 3.80 meters (12 feet 8 inches). For the rotating part of the machine the weight is 37.5 tons, while the entire generator weighs no less than 86 tons. The present machine is to be coupled direct to a powerful gas engine and heavy flywheel.

The Société Alsacienne is engaged in building a second generator of the same construction, and this will no doubt be followed by others.

Telephone Exhibits at the Panama-Pacific International Exposition.

The American Telephone and Telegraph Company, with its associated telephone companies, together with the Western Union Telegraph Company, will, at the Panama-Pacific International Exposition in 1915, erect a building within the Palace of Liberal Arts wherein all that is most interesting in the history of the telephone will be installed.

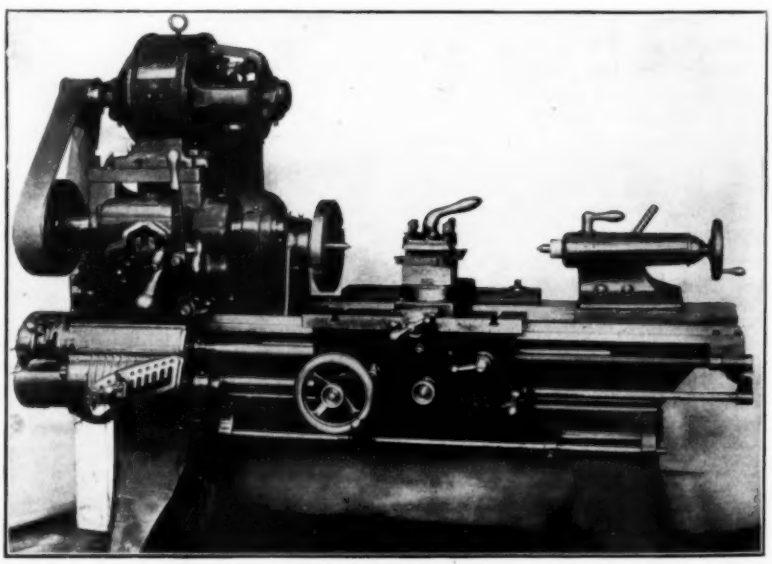
In one of the inclosures of the Telephone and Telegraph building will be presented a series of lectures, illustrated by motion pictures and other views, explaining and describing many of the interesting features connected with the world-wide service of telephone and telegraph. In this auditorium there will be demonstrations given of long-distance telephony by which the audience—which may number 300—will be brought into auditory touch with many distant points.

The proposed exhibit includes the original forms in which telephones and transmitters made their appearance; exterior views of many telephone buildings throughout the country; interior view showing operators at work, and various details of the working service; views of operators in the training schools; operators' luncheon rooms and recreation equipment, installed by the company; the laying and splicing of submarine and underground cables; battery and power plants in operation; illustrations of simultaneous telegraphy and telephony over the same wires; showing the method whereby three telephone messages and eight telegraph dispatches are sent at once over four wires without interference; original forms of telegraph instruments and their development to their present perfected state; the cable service, with illustrations of siphon recording; telegraphic time service, showing how clocks in a community are regulated to an accurate uniformity from a single station such as Mount Hamilton; processes in the manufacture of cables, the installation of wires, the winding of magnets, etc.

Motor-Driven Geared Head Lathe.

The illustration herewith shows a motor-driven 16-inch geared head lathe manufactured by the Hendley Machine Company, Lorrington, Conn. The machine is designed to meet all conditions imposed by the use of high-speed steels, and is said to be ideal for rush jobs. The controlling levers are all within easy reach from one position in front. There are eight mechanical changes of speed for the spindle in geometric progression with the power shaft running at constant speed. There is a minimum spindle speed of 11 revolutions per minute with an extreme high speed of approximately 687 revolutions.

The forward and rear spindle journals are self-adjusing and adjustable independently of each other, thus allowing for contraction and expansion of the spindle without disturbing the adjustment. The carriage is stopped automatically in both directions when either feeding or screw cutting. This arrangement is invaluable for internal work to shoulders, and for duplicating pieces. The machine is driven by a 2.75 horsepower Westinghouse motor, running 900 to 1,200 revolutions per minute.



Motor-Driven Geared Head Lathe.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

FORT CALHOUN, NEB.—Citizens of this place have started a movement for electric lights. C.

NEW LONDON, MO.—E. B. Marmaduke is negotiating with the Council to establish a light plant here.

SWEA CITY, IOWA.—The Council will establish electric lighting here. Address the city clerk for particulars.

GREENBURG, KANS.—This town recently voted $20,000 in bonds to install a waterworks and electric light plant.

BEAVER DAM, KY.—This city has voted to issue bonds for the purpose of constructing an electric light system. G.

KEWANEE, ILL.—A municipal electric light plant may be established here. Address the city clerk for particulars.

STERLING, ILL.—The Council plans to establish an $8,000 electric plant. Address Mayor A. C. Stauley for desired information.

CLATSOP, ORE.—The Seaside Light & Power Company has been granted a 30-year franchise to operate in this city.

LUBBOCK, TEX.—The Council has decided to increase the ornamental lighting system. Address the city clerk for information.

GREENVILLE, N. C.—The City is planning to expend $25,000 to improve the light and water plant. Address the mayor for particulars.

ELGIN, ILL.—New lighting systems will be installed in Wing and Lord's Parks next spring, according to Commissioner Russell. Z.

TOYAH, TEX.—The Toyah Electric Light Company is planning to purchase and install a 25-horsepower internal combustion engine.

FOND DU LAC, WIS.—The Fond du Lac Avenue Advancement Association has been organized here, and will establish a lighting system.

INDIANAPOLIS, IND.—Henry W. Klausman, city engineer, expects to have specifications for a new electric street lighting system here.

WILMINGTON, N. C.—Councilman Wood has been requested to confer with electrical engineers as to the probable cost of a municipal plant.

BLUE EARTH, MINN.—J. M. Malmin, president of the Commercial Club was made chairman of a committee to install a "White Way" lighting system. C.

TECUMSEH, MICH.—The Council plans to establish electric lighting. The present contract expired last June. Address the city clerk for information.

ROCHESTER, MINN.—A franchise has been granted to the Zumbro Power Company for a transmission line from Zumbro Falls. Thomas O'Sullivan is city clerk. C.

GALLIPOLIS, O.—The Council asks bids on street lighting. Experiments have been in progress. Dr. Bean is chairman of the Street Lighting Committee. R.

COLUMBUS, GA.—The Muscogee Light & Power Company has been incorporated with a capital stock of $50,000 by Edwin W. Swift, J. P. Illges and others.

TRENTON, N. J.—The Public Service Electric Company will immediately commence the erection of a new substation on Olden Avenue, estimated to cost about $13,000. A.

GLASGOW, KY.—Mays & Schlinker, this city, have leased the electric light plant of J. D. Read, Scottsville, Ky., and plan the installation of a new engine and dynamo. G.

NATCHEZ, MISS.—On December 17 bids will be received for the lighting of the city streets for a term of five years. Address the city clerk for desired information.

UPPER SANDUSKY, O.—The proposition to bond the city for $25,000 to build a municipal light plant carried at the recent election. Bids will be opened soon. R.

SALEM, N. J.—The power house and boiler plant as well as other structures of the Salem Glass Works were partially destroyed by fire; the plant will be immediately rebuilt. A.

LYNDON, KANS.—Osage County Light & Power Company has been incorporated with a capital of $4,000 by H. H. Kiehl, Berta E. Dale, W. H. Tyner, S. E. Hood, L. T. Hursey.

BRYAN, TEX.—The Bryan & Central Texas Interurban Railway Company contemplates building a power house here and purchase a generator and engine of 150-horsepower capacity.

FINDLAY, O.—The Board of Education has ordered the purchase of a variable-speed three-phase 7.5-horsepower motor to operate ventilating apparatus for the Central School building. R.

SWANTON, O.—The Swanton Light & Power Company has been incorporated with a capital of $10,000 by Abner D. Baker, Fred E. Pilliod, T. J. Pilliod, Robert S. Graves and A. Q. Price.

LOUISVILLE, KY.—The Louisville Clothing Company, has increased its capitalization from $30,000 to $100,000 and is planning to enlarge its capacity. Electric motors will be needed. M. R. Harned is president. G.

CINCINNATI, O.—The Union Gas & Electric Company will begin the construction of a new powerhouse of large capacity in the near future. Address Vice-President W. Winans Freeman for information. G.

CATHLAMET, WASH.—The City Council has granted a 25-year franchise to Ingalls Brothers for furnishing Cathlamet with electric lights. The terms of the franchise provide for a 10-year street lighting contract.

EL CENTRO, CAL.—The Holton Power Company is preparing to extend its service into the Imperial Valley. Connection will be made with the Southern Sierra Power Company's line at a point near Banning.

SALEM, ORE.—State Engineer Lewis has received notice that $15,000 has been appropriated for investigation of the Celilo power project, which is located near The Dalles. This project may be developed by the states of Oregon and Washington. O.

HARRODSBURG, KY.—This city will buy the following equipment for its electric light plant: 18,725 feet of wire; one 7x2 switchboard; one 150-kilowatt unit; one 200-horsepower boiler; stokers for three boilers and one boiler feed pump. G.

KEWANEE, ILL.—The City Council is contemplating the installation of a municipal electric light plant which will also sell power for commercial use. The City Council has been instructed to secure an estimate from an engineer of the probable cost. Z.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company has been granted permission by the California Railway Commission to issue $27,000 of bonds, the proceeds to be used for additions and betterments to the company's plant.

YOUNGSTOWN, O.—The Mahoning Valley Light Company has been incorporated to erect a big power plant, string wires, install conduits, and in general carry on an electric-lighting business. Michael Liebel, of Erie, Pa., is president, and Harry Engle, secretary-treasurer.

MAYSVILLE, KY.—This city is advertising for bids on the establishment and operation of a street lighting system. The municipality plans to spend in the neighborhood of $10,000 a year. An ornamental lighting system for the down-town section is one of the features of the proposed system. G.

BEND, ORE.—Manager Foley, of the Bend Water Works, Light & Power Company, plans installing a "Great White Way" in Bend. Property owners on Bond, Oregon and Wall Streets are also agitating the proposition of installing elaborate street lighting system of cluster lights in their district. O.

OTTUMWA, IOWA.—The water works trustees have submitted a report to the City Council recommending a bond issue of $125,000 for building a concrete dam across the Des Moines River to develop power with which to light the streets and parks with electricity. Address the city clerk in regard to this project.

LEXINGTON, KY.—The Kentucky Utilities Company, which recently purchased a steam power plant at Varilla, Ky., will establish substations at Pineville and Middlesboro, Ky., for use in furnishing current to coal mines in that territory. The current will be transmitted from the main plant at a voltage of 33,000. G.

HARTFORD, CONN.—The Tunnel Power Company of Norwich has been incorporated by Charles W. Comstock of that city, and his associates to take over certain power rights on the Quinebaug River, with a capitalization of $100,000, and has organized for business with $10,000 paid in and Mr. Comstock as president.

PERTH AMBOY, N. J.—Acting upon the request of property owners on State Street, the Board of Aldermen is considering the installation of a new street lighting system along such thoroughfare, to form a "White Way." Ornamental iron uprights and brackets are planned. The city electrician has been directed to investigate the proposition. A.

MT. BLANCHARD, O.—Bert L. Marvin, of Findlay, O., has secured a franchise for the erection of an electric light plant in this town. The contract is for ten years and provides for 100-watt lamps to run until 11:30 each night. The plant must be in operation within six months. A plant will be erected and will provide a market for complete equipment. H.

CLEVELAND, O.—Ordinances authorizing the expenditure of $37,000 for cables and $18,504 for transformers for the new municipal lighting plant were presented to the Council on November 16. Sealed bids are open for distribution switchboard and equipment and for steam turbine-driven exciter until December 10. W. J. Springborn is director of public service; W. H. Kirby, secretary. R.

LOVELAND, COLO.—Through the action of the Light Committee of the Loveland City Council, authorizing the taking over of the plans and filings of G. W. Foster for a reservoir and power site on the Big Thompson River, 14 miles west of the city, it is assured that a municipal light plant will be in operation by the time the city's contract with the power company expires next spring.

TOMS RIVER, N. J.—If the plans of interested parties materialize, Toms River will in the near future see work on the construction of a large electrical generating plant, and a 20-ton ice plant. Philadelphia capitalists have been looking into the advisability of establishing the plants here and their reports are encouraging. It is planned to establish a waterpower proposition for generating electricity at the point of a natural depression in the river west of the town, at an estimated cost of $200,000.

LITTLE ROCK, ARK.—A recent visit to Little Rock by the officials of the American Cities Company, owners of the street railways of Little Rock, Memphis and other southern cities, has resulted in the announcement that the local company has been authorized to expend $3,500,000 for development of the Ouachita River water power near Little Rock. It is proposed to furnish not only sufficient power to operate the street railway lines of Little Rock, but also supply power for Memphis.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

HINSDALE, MONT.—R. J. Moore proposes to install a telephone system. C.

BELVIDERE, N. J.—The Borough Council is considering the installation of a new fire alarm system. A.

BALDOCK, S. C.—The Baldock Telephone Company has been incorporated by Wick Ashe, T. B. Warren and others.

LA PORTE, MINN.—The La Porte and Yola Rural Telephone Company has been organized. A. F. Almquist is secretary. C.

STREETMAN, TEX.—A Co-operative Telephone Company has been organized here with a capital stock of $6,000. Address the city clerk for particulars.

GRAHAM, MO.—People's Telephone Company has been incorporated, capitalized at $6,510. The incorporators are G. M. McNeill, O. L. Mewrey and George Elliott.

EMPIRE, CAL.—The Empire Telephone Company has applied to the State Railroad Commission for a certificate of public necessity and convenience to operate in this vicinity.

VENTURA, CAL.—A 30-year franchise to operate in this city will be offered for sale on December 15. Application for the same was made by the Pacific Telephone & Telegraph Company.

PLACERVILLE, CAL.—C. R. Lorraine and his associates have been granted the right to construct a rural telephone line along the Green Valley road from Rescue to the Sacramento County line.

KERRISDALE, B. C.—The Strathcona Heights Improvement Association has asked the City Council to take up the question of extending the Bay View telephone system to the Strathcona Heights district. O.

SAN FRANCISCO, CAL.—Articles of incorporation have been filed here for the Physicians & Surgeons Telephone Exchange, with a capital stock of $10,000, by J. M. Litchfield and W. C. and Katherine L. Vivell.

OKLAHOMA CITY, OKLA.—Thompson Rural Telephone company, of Okarche, has been incorporated by Henry Mueggenburg, Wesley Yeck, Henry Wittrock, J. O. Falser, Joseph Yeck and F. L. Kordis, all of Okarche.

JUDITH GAP, MONT.—Samuel Riggs and Ray Greathouse have made plans for the immediate construction of a telephone line from this place to the forest rangers station near Snowies Station. Farmers and ranches along the line have agreed to install the service. O.

MOOSE LAKE, MINN.—The Salo Co-operative Telephone Association has been incorporated at Lawler at $4,000. The president is Henry Ulvi; vice-president, John Sentaback; secretary, Gust Salvi; treasurer, Emil Lundeen; directors, T. A. Wilen, Henry Likala and John Niemi.

CLE ELUM, WASH.—The Pacific Telephone Company will place an additional copper circuit between Cle Elum and Blewett, at a cost of $8,000. This is a part of a project to establish two additional circuits between Seattle and Spokane, which will involve the expenditure of more than $100,000. O.

ELECTRIC RAILWAYS.

(Special Correspondence.)

KANSAS CITY, MO.—The Metropolitan Street Railway Company is planning to extend its lines. Address P. J. Kealy, manager, for information.

CHAMBERSBURG, PA.—The Chambersburg & Shippenburg Railway Company is having plans and surveys prepared for a 20-mile extension to Carlisle, Pa., *via* the Walnut Bottoms Road.

INDIANAPOLIS, IND.—The Terre Haute, Indianapolis & Eastern Traction Company, is considering the extension of its line from Crawfordsville to Veedersburg. Address the manager for information.

LANCASTER, PA.—H. W. Crawford, engineer, is preparing plans and surveys for a new electric route from Lancaster to McCalls Ferry, to be constructed by the Conestoga Traction Company.

POCATELLO, IDAHO. — J. D. Browning, who is promoting construction of a storage battery street railway system here, announces that capital has been secured and that materials will be ordered at once. O.

MT. VERNON, ILL.—The Mt. Vernon Traction & Car Company has been organized here with a capital stock of $40,000, and expects to begin work in a short time. Louis G. Pavey is president.

ELMIRA, ILL.—Roricks Glen, near this city, is to be improved and connected with the city by an electric line. Address the secretary of the Elmira Water, Light & Railroad Company for information.

MUSKOGEE, OKLA.—A connecting line of railway between the town of Coalgate, Okla., and the nearest point on the Katy system to that town has been chartered by G. W. Bruce, C. C. Bishop and others.

SAN RAFAEL, CAL.—The Railroad Commission has granted the San Anselmo Valley Electric Railway authority to build the road which will connect this city at a point near the Union Station with San Anselmo and Fairfax for a single five-cent fare.

SPRINGVIEW, NEB.—An electric road is proposed from here to Ainesworth, a distance of 25 miles, at a cost of $17,500 per mile. The road to be built and owned by local capital, the power to be secured from the Ainsworth Light & Power Company. C.

SHERON, PA.—Definite announcement that the Mahoning Valley Street Railway will extend its line from Newcastle, Pa., to Beaver Pa., has been made by President R. P. Stevens. About 25 miles of track will be laid when surveyors complete their work.

PORTLAND, ORE. — Robert E. Strahorn, president of the Portland, Eugene & Eastern Electric Railway, recently announced that an electric line will be built from Portland to Salem, *via* Woodburn. Work of construction is to begin early in the spring. O.

SACRAMENTO, CAL.—Simultaneous with the announcement that a city is to be built in West Sacramento comes the statement from an authoritative source that street-car service between Sacramento and West Sacramento will be inaugurated upon the opening of the new city.

VISALIA, CAL.—The Big Four Electric Railroad has been granted a franchise to operate a city street car system in connection with its interurban line now building between Visalia and Tulare. According to the terms of the franchise work must be started within 60 days and completed in two years.

CHICAGO, ILL.—The Chairman of the Committee on Local Transportation of the City of Chicago, Eugene Block, may be addressed for particulars regarding the construction, equipment, maintenance and operation of a comprehensive system of rapid-transit subways for passenger transportation in the city of Chicago.

INDIANAPOLIS, IND.—The Public Service Commission has issued an order allowing the Ft. Wayne & Northern Indiana Traction Company to issue $600,000 worth of notes and $1,000,000 worth of bonds as collateral for the notes. The money is to be used by the road in a general rehabilitation for its property.

GREEN BAY, WIS.—A Plan to construct an interurban line from Sturgeon Bay to Ephriam in Door County has been decided upon. E. E. Galle & Company of Minneapolis are now interested in the project and are endeavoring to dispose of $175,000 worth of stock. The plan is to later connect Sturgeon Bay with Green Bay if the necessary capital can be raised. Work will be started in the spring.

BOSTON, MASS.—A direct trolley line from Boston to Fitchburg by way of Concord and Ayer is a possibility. Six years ago such a line was proposed, but the project was not undertaken. The appearance of surveyors in Concord has given rise to the story that a survey is being made for the line, over which direct cars would be run as far as Ayer and then from Ayer to this city over the F. & L. lines.

SAN FRANCISCO, CAL.—The Ocean Shore Railroad Company is going ahead with its plans to electrize the road and to refinance the company. The changes that are to be made are so radical that they will be submitted to the stockholders at their next meeting for final action; in the meantime the officers and directors are arranging the details so that there will be no delay. When everything is done there will be a modern depot in San Francisco, a modern electric line and plenty of service. The new company will have an issue of $5,000,000 in bonds.

AINSWORTH, NEB.—Articles of incorporation have been signed for the building of the Nebraska Central railway. The proposed road will run from Ainsworth to Springfield at first and then extend northward. This will be an electric line. The power will be furnished by the Ainsworth Light & Power Company's big dam on Plum Creek, 13 miles north of this city. Sufficient capital has been promised to warrant the promoters to incorporate. The directors of the company are Colonel George W. Adams, of Walnut, Iowa; V. A. Hill, of Council Bluffs; F. K. Strother, of Omaha; R. F. Osborn, W. V. Finney, Frank Sellers and Arthur McSweeney, all of Ainsworth, and Ned Jones, John Schie and C. E. Lear, of Springview.

PROPOSALS.

ELECTRICAL FIXTURES.—Sealed proposals will be received by Dr. Herman G. Morgan for furnishing the electrical fixtures in the two new ward units which are being completed at the city hospital.

GENERATING PLANT.—The Allen County Board of Commissions, Lima, O., will receive bids until December 8 for the installation of a generating plant for the Allen County infirmary. The plant will include motor, generator, storage batteries and all other accessories. H. J. Lawlor is clerk of the board. R.

SWITCHBOARD AND ELECTRIC CABLE.—Sealed proposals will be received by the Isthmian Canal Commission, Washington, D. C., until December 3 for furnishing switchboard, electric cable, conduit and fittings, miscellaneous electrical apparatus and structural steel. Further information may be obtained by application to F. C. Boggs, General Purchasing Officer.

CONDUIT AND WIRING SYSTEM.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until December 8 for a conduit and wiring system in the marine hospital at Evansville, Ind.; and also for the same for the post office at Port Huron, Mich. Drawings and specifications may be obtained from the custodians of the sites or from the office of the Supervising Architect.

ELECTRIC EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until December 9 for furnishing 39 portable electric safety lanterns, and 20,000 feet of twisted telephone wire, to be delivered at the Navy Yard, Brooklyn, N. Y., as per Schedule 6,055; until December 16 for furnishing two electrically driven ventilating fans, to be delivered at the Navy Yard, Puget Sound, Wash., as per Schedule 6,041.

ELECTRIC CONDUIT AND WIRING AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until December 20 for furnishing the electric conduit and wiring and interior lighting fixtures in the customhouse in St. Louis, Mo.; and until December 27 for the same for the post office at Macomb, Ill., in accordance with drawings and specifications, which may be obtained either from the Supervising Architect or the custodians of the sites named.

FOREIGN TRADE OPPORTUNITIES.

(Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C. In applying for addresses refer to file number.)

NO. 12,044. MOTOR CARS.—A report from an American consul states that an official in a foreign country desires to be furnished with catalogs and prices of high-class American motor cars.

NO. 12,029. GAS-ELECTRIC CARS AND ELECTRIC BAGGAGE TRUCKS.—A report from an American consular officer states that a railroad in his district has under consideration a scheme to use gas-electric cars on one of its branch roads and electric baggage trucks at its stations.

FINANCIAL NOTES.

It is expected that the gross sales of the Western Electric Company for 1913 will total about $76,000,000, or a gain of six per cent over the previous twelve months.

Stockholders of the Wireless Liquidating Company have authorized the immediate dissolution of the company. Instructions were given the directors to distribute, as far as possible, the stock of the Marconi Wireless Telegraph Company of America, held in the company's treasury, in specie. It was also voted that in case any stockholders, in the distribution of Marconi Wireless stock, shall become entitled to fractional shares, these fractions shall be transferred to a trustee, who shall issue scrip therefor, such scrip to be exchangeable for full shares whenever presented in sufficient quantities.

A special meeting of the stockholders of the Detroit Edison Company has been called for December 17 next to authorize an issue of $6,000,000 six-per-cent ten-year convertible debenture bonds and to increase the authorized capital stock of the company from $15,000,000 to $25,000,000. No part of the stock will be issued at present. The company plans to offer $3,500,000 of the $6,000,000 convertibles for subscription to stockholders at par to the extent of 25 per cent of their holdings. The proceeds from the new issue are to be utilized in reimbursing the company's treasury for moneys already expended for improvements, betterments, etc., and also to provide funds for extensions, etc., contemplated for the immediate future.

It is announced that $10,000,000 of the seven-per-cent non-cumulative preferred stock out of the issue of $12,500,000 authorized last June at a meeting of the stockholders of the Barcelona Traction, Light & Power Company will shortly be offered for subscription at par in London, Paris and Brussels. It was announced some time ago that this $10,000,000 had been underwritten. In the present condition of the market none of this stock is to be offered in Canada, where the company is controlled, but if conditions improve some part may be offered on this side next spring. The stock is redeemable at 100 in 15 years and the company has the right to call it at 110 after 1918.

Southern California Edison Company has issued circulars to stockholders announcing the issue of $2,000,000 additional common stock pro rata to stockholders at $85 a share. This issue of stock has been approved by the California Railroad Commission and has been underwritten by New York bankers. It is stated that the underwriting was twice oversubscribed. It is also announced that beginning with the next dividend the rate on California Edison common and preferred will be advanced from five per cent to six per cent a year, and an extra scrip dividend representing the dividends due to equalize the payments on preferred and common stock will be issued to stockholders as of November 1, this scrip being equivalent to $1.78 a share. The scrip will bear five-per-cent interest and will be redeemable in cash in the fall of 1914.

To increase the capital stock of the Washington Water Power Company from $15,000,000 to $20,000,000 notices have been sent to stockholders of the company calling a special meeting for December 2. At present the company has 150,000 shares of stock and the increase will give

it 200,000. Should the plan be approved the company will offer to the present stockholders about January 11, the right to subscribe at par, for stock amounting to 10 per cent of the stock they hold on December 2. The company now has $14,081,900 worth of stock issued. The funds to be obtained from the issuance of the new stock are to be used for construction work at Long Lake and other extensions of the business.

Dividends.

Baltimore Electric Company, regular semi-annual of 2.5 per cent on the preferred stock, payable January 26 to stock of record December 20.

Baton Rouge Electric Company; semi-annual of $3 on preferred, payable December 1 to stock of record November 20.

Chicago Elevated Railways Company; regular quarterly of $1.50 on the preferred certificates, payable December 1 to stock of record November 20.

Cities Service Company; regular monthly of 0.5 of one per cent on common and 0.5 per cent on preferred, both payable December 1.

Connecticut Power Company; regular quarterly dividend of $1.50 on the preferred stock, payable December 1, to stock of record November 24.

Consolidated Gas Electric Light & Power Company; regular quarterly of 1.5 per cent on the common stock, payable January 2 to stock of record December 20.

Dominion Power & Transmission, Ltd.; two per cent on the preferred, payable December 15 to stock of record November 30.

Louisville Traction Company; regular quarterly of one per cent on the common stock, payable January 1 to stock of record December 10.

Portland Railway, Light & Power Company; quarterly of $1 a share, a reduction of 25 cents quarterly, payable December 1 to stock of record November 18.

Utilities Improvement Company; regular monthly of 0.5 per cent on preferred and one-sixth of one per cent on common, payable December 1.

Reports of Earnings.

NORTHWESTERN ELEVATED.

The Northwestern Elevated Railroad Company has issued its reports for the year ended June 30, 1913. The income account compares as follows:

	1913	1912
Gross	$3,186,583	$3,177,215
Expenses	1,344,719	1,314,394
Net	1,841,684	1,862,821
Charges, taxes, etc.	1,840,991	1,745,066
Surplus	873	117,755
Preferred dividends		98,888
Surplus	873	18,867

SOUTH SIDE ELEVATED.

The report of the South Side Elevated Railroad Company for the year ended June 30, 1913, compares as follows:

	1913	1912
Gross	$2,470,664	$2,464,020
Expenses	1,122,168	1,105,569
Net	1,348,496	1,358,451

The deficit for the year ended June 30, 1913, after charges, depreciation and dividends was $74,098 as compared with a surplus of $96,090 the previous year.

PACIFIC LIGHT & POWER CORPORATION.

Pacific Light & Power Corporation reports earnings for the nine months ended September 30, 1913, as follows:

	1913	1912
Gross earnings	$2,018,526	$1,790,967
Net after taxes	959,054	808,277
Surplus after charges	601,287	437,787

SOUTHERN CALIFORNIA EDISON.

	1913.	1912.
October gross	$ 414,092	$ 370,630
Net after taxes	209,335	148,918
Surplus after charges	133,739	87,643
Balance after preferred dividend	117 072	70,976

ST. JOSEPH RAILWAY, LIGHT, HEAT & POWER.

	1913.	1912.
October gross	$ 103,814	$ 103,953
Net after taxes	41,945	47,388
Surplus after charges	22,127	27,757
Twelve months gross	1,236,644	1,164,156
Net after taxes	532,777	490,712
Surplus after charges	292,417	254,984
Balance after preferred dividends*	214,417	176,984

*Equivalent to 6.1 per cent on the common stock.

CHATTANOOGA RAILWAY & LIGHT.

	1913.	1912.
October gross	$ 99,258	$ 95,580
Net after taxes	36,911	38,974
Surplus after charges	11,053	16,374
Twelve months gross	1,194,265	1,040,465
Net after taxes	484,390	420,551
Surplus after charges	191,854	159,580

KING'S COUNTY ELECTRIC.

	1913.	1912.
October gross	$ 489,024	$ 427,016
Net after taxes	172,078	130,017
Other income	54,253	47,444
Total income	177,776	135,036
Surplus after charges	106,094	57,470
Ten months gross	4,562,997	4,194,531
Net after taxes	1,678,707	1,440,926
Other income	54,253	47 444
Total income	1,732,960	1,488,370
Surplus after charges	1,000,774	749,052

CHICAGO RAILWAYS.

The report of the Chicago Railways Company shows earnings for the twelve months ended September 30, last, in comparison with the fiscal year ended January 31 last, as follows:

	Year ended Sept. 30, '13	Year ended Jan. 31, '13
Gross earnings	$19,253,263	$18,076,777
Operating expenses and taxes	12,189,812	11,728,502
Net earnings	$7,063,451	$6,348,275

The company's corporate income and expenses for the same period, with comparisons, are unofficially estimated as follows:

	Year ended Sept. 30, '13	Year ended Jan. 31, '13
Net earnings	$7,063,451	$6,348,275
Less interest on valuation	3,850,000	3,778.449
Balance	$3,213,451	$2,569,826
City of Chicago, 55 per cent	1,767,398	1,413,404
Chicago Railways, 45 per cent	1,446,053	1,156,422

The non-partnership account follows:

	Year ended Sept. 30, '13	Year ended Jan. 31, '13
Interest on valuation	$3,850,000	$3,778,440
45 per cent of net	1,446,053	1,156,422
Miscellaneous	100,000	204,269
Total	$5,396,053	$5,149,140
Less—		
Interest on bonds	$4,438,500	$4,303,489
Sinking fund	250,000	250,000
Corporate expenses and adjustments	100,000	120,574
Total	$4,788,500	$4,674,663
Balance	607,553	475,076

NEW YORK RAILWAYS.

	1913	1912
September gross	$1,214,051	$1,169,395
Net after taxes	383,301	375,694
Other income	27,581	34,868
Total income	410,882	410,562
Surplus after charges	135,758	131,485
Passengers carried	23,960,464	22,569,724
Three months' gross	3,573,791	3,485,464
Net after taxes	1,077,485	1,056,160
Other income	85,334	100,310
Total income	1,162,819	1,156,470
Surplus after charges	332,304	319,252
Passengers carried	70,418,929	69,591,613

SOUTHWESTERN POWER & LIGHT.
(Subsidiary Companies.)

	1913.	1912.
October gross	$ 207,229	$ 173,068
Net after taxes	93,775	74,827
Six months gross	1,096,514	951,718
Net after taxes	507,512	404,818
Twelve months gross	2,186,287	1,867,366
Net after taxes	985,593	824,904

FORT WORTH POWER & LIGHT.

	1913.	1912.
October gross	$ 63,975	$ 44 892
Net after taxes	35,734	20,505
Surplus after charges	28,291	14,992
Twelve months gross	631,630	493,528
Net after taxes	367,625	238,835
Surplus after charges	288,320	179,877
Balance after preferred dividends	242,246	136,477

ALLIS-CHALMERS.

The income account of the receiver of the Allis-Chalmers Company, as reported to the New York Stock Exchange for the period from April 6, 1912, to April 15, 1913, inclusive, follows:

Sales billed	$9,933,390
Cost of sales billed, including maintenance and depreciation	8,647,023
Factory profit	1,286,367
Selling, publicity, administrative and general expense	1,238,725
Net manufacturing profit	47,642
Other income, less interest, etc.	210,223
Net profit	257,865

The income account of the receiver of The Allis-Chalmers Company from October 1, 1912, to April 15, 1913, the date of the termination of the possession of the receiver, and of the operations of the Allis-Chalmers Manufacturing Company from April 16, 1913, to September 30, 1913, together with the total for the twelve months ended September 30, 1913, follows:

	Oct. 1, '12, to April 15, '13	April 16, '13, to Sept. 30, '13	Total
Sales billed	$5,211,338	$6,449,021	$11,660,359
*Cost of sales billed	4,589,164	5,549,299	10,138,463
Factory profit	622,173	899,721	1,521,895
Selling and gen. exp.	667,888	501,175	1,169,063
Manufact. deficit	45,714	.....	.....
Net manuf. profit	.....	398,546	352,831
Oth. inc., less int., etc.	122,727	125,750	248,478
Net profit	77,012	524,297	601,310

*Including maintenance, depreciation, etc.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Nov. 24	Nov. 17
American Tel. & Tel. (New York)	118½	119⅜
Commonwealth Edison (Chicago)	128¼	133
Edison Electric Illuminating (Boston)	260	257½
Electric Storage Battery common (Philadelphia)	45	46
Electric Storage Battery preferred (Philadelphia)	45	46
General Electric (New York)	139	139
Kings County Electric (New York)	119	119
Manhattan Transit (New York)	1⅛	1⅛
Massachusetts Electric common (Boston)	11	11
Massachusetts Electric preferred (Boston)	65	65
National Carbon common (Chicago)	130	135
National Carbon preferred (Chicago)	112	112
New England Telephone (Boston)	133	135
Philadelphia Electric (Philadelphia)	22	22⅜
Postal Telegraph and Cables common (New York)	78	77
Postal Telegraph and Cables preferred (New York)	64½	63
Western Union (New York)	62½	62¼
Westinghouse common (New York)	63⅞	65
Westinghouse preferred (New York)	112	109

PERSONAL MENTION.

MR. ARTHUR BROWN has been made manager for the properties of the Central Illinois Public Service Company at Edinburg, Ill.

MR. E. B. SEVERS has resigned as superintendent of motive power for the Tri-State Railway & Electric Company to accept a position with the J. G. White Management Corporation, of New York City.

MR. H. W. YOUNG, president of the Delta-Star Electric Company, Chicago, Ill., addressed the Illinois Northern Utilities Branch of the National Electric Light Association, Dixon, Ill., at the meeting on November 21 on the subject of "Selling Power from High-Tension Lines." Some 40 lantern slides were shown to illustrate many of the modern high-tension installations.

MR. M. H. GRAY, formerly manager of the Sackett Mine Supply Company, Springfield, O., is now associated with The Gray Electric Company, of the same place, conducting a general construction business and handling motors and generators and installing power plants. The new company is just completing the installation of a 20-station auto-call system and reports a good substantial business.

MR. F. H. CHAMBERLAIN, of New York, has been appointed general manager of the Alabama Power Company, the operating corporation of the Alabama Traction, Light & Power Company, with headquarters at Birmingham. Mr. FRANK WASHBURN, of Nashville, was recently elected president of the same company. MR. JAMES MITCHELL, of New York City, is the president of the holding company of the Alabama Traction, Light & Power Company.

MR. MAX LOEWENTHAL, the well known consulting electrical engineer, who has recently settled in Los Angeles, Cal., will address the Los Angeles Chapter of the American Institute of Electrical Engineers on the evening of December 16. Mr. Loewenthal will talk on the subject of "Electricity in the Home." It is expected that a large attendance will be present as invitations are being sent to all interested in the subject whether they are connected with the industry or not.

OBITUARY.

MR. HENRY M. RICHARDS, vice-president of the Spokane & Eastern Trust Company and chairman of the Board of the Washington Water Power Company, succumbed to injuries sustained in a runaway which occurred on November 9.

MRS. AGNES L. SCRIBNER, wife of Jesse Scribner the district manager of the lighting department, General Electric Company, Chicago, died on November 24 at the German Hospital. Mr. Scribner is widely known in the electrical industry having been connected with the General Electric Company and the Thomson-Houston Company for the past 24 years, and his many friends will hear with sorrow of his great loss.

MR. EVERETT FLEET MORSE, secretary and also a director of the Morse Chain Company, died at his home, Ithaca, N. Y., Tuesday, November 11. Mr. Morse was born at Ithaca, June 28, 1857. When only 16 years of age he patented an improvement on the horse-drawn Lag rake and made good use of the earnings from his first invention to supplement other efforts to give him an education. He attended Cornell University in 1875, and after being out for several years graduated with the class of 1884 as a mechanical engineer. After spending some time in Algona, Iowa, where he was manager of a flax mill, he returned to New York State and settled at Trumansburg. Here in 1893 he patented the Morse rocker-joint chain for bicycles and in conjunction with his brother, Mr. F. L. Morse, founded the Morse Chain Company and began the manufacture of bicycle chains. The correct mechanical principle embodied in this chain, as well as its novelty, attracted immediate attention and eventually secured for the company a profitable business which lasted until the phenomenal slump in the bicycle trade about 1897. In the meantime Mr. F. L. Morse, who has been the active manager of the Chain Company for the past 13 years, developed the present type of silent chain for power purposes and during 1906 built the new plant at Ithaca where the business has grown from small beginnings to its present proportions. Mr. Morse for some years past devoted himself very largely to his heat gauge interests and to various public duties in which he was most active and efficient. The Morse thermo gauge which Mr. Morse invented was patented in 1900, is a most ingenious device for the measurement of the temperature of steel, and won him much distinction at home and abroad, having been adopted by both the United States and German Bureaus of Standardization. In recognition of the high mechanical merit of the rocker joint chain and thermo gauge, Mr. Morse was awarded medals by the Franklin Institute, an honor attained by few inventors.

NEW INCORPORATIONS.

MILWAUKEE, WIS.—Piepkorn-Henning Electric Company has been incorporated with a capital stock of $5,000, by J. A. Piepkorn, Walter Henning and B. Beebe.

ST. LOUIS, MO.—Killark Electric Manufacturing Company has been incorporated to do a general electric device, apparatus and appliance business. The capital stock of this company is $2,000.

SKIPPACK, PA.—Alvin C. Aldorfer, Harleysville; John F. Lederach, Ledarachville, and D. M. Andros, Fairview, have taken out a charter for the Montgomery Light & Power Company, capitalized at $5,000.

NEW YORK, N. Y.—Martin Adams & Company, Incorporated, has filed articles of incorporation, capitalized at $15,000. The incorporators are Everett L. Adams, William P. Heineken and Percival V. Martin, of New York City.

NEW YORK, N. Y.—Kleinschmidt Electric Company, Incorporated, has filed articles of incorporation, capitalized at $100,000. The incorporators are Bernard Kleinschmidt, William Kleinschmidt and Frederick Kleinschmidt, all of New York City.

PROVIDENCE, R. I.—The Trioleum Power Company has been incorporated to deal in fuel to be used in generating power, both motor and steam. The capital stock is $10,000. The incorporators are Harlow W. Eaite, John B. Desrosiers and Harry W. Stiness.

HARRISBURG, PA.—H. H. Ganser, P. A. Wilson and W. G. Gaston, of Norristown, have taken out charters for companies to operate in the following townships and named after them: Frederick, Skippack, Perkiomen and Worcester. The capital stock of each company is $5,000.

NIAGARA FALLS, N. Y.—Fermoile-Johnson Storage Battery Company, Incorporated, has been incorporated for the purpose of manufacturing storage batteries and electrical goods. The capital stock is $15,000 and the incorporators are Daniel Fermoile, Marie Fermoile and Harrison W. Johnson, all of Niagara Falls.

NEW PUBLICATIONS.

CANADIAN METALS.—The Department of Mines, Ottawa, Can., has issued a bulletin entitled "The Production of Copper, Gold, Lead, Nickel, Silver, Zinc and Other Metals in Canada During the Calendar Year 1912," by C. T. Cartwright. This covers the production, prices, exports, imports, etc. The Department has also issued a summary report of the Mines Branch for the year 1912. This covers both the field work and the work of chemical laboratories, assay office, testing station, etc.

CHICAGO RAILROAD TERMINALS.—Bion J. Arnold, consulting engineer for the Citizens' Terminal Plan Committee of Chicago, has submitted his report on the rearrangement and development of the steam-railroad terminals in the city. The report forms a book of 237 pages with many maps, plats and diagrams. It is a comprehensive study of the complicated problems of systematizing the railroad terminals in the world's largest railroad center. Mr. Arnold makes many striking and far-reaching suggestions, the carrying out of some of which will involve electrification. Among the suggestions is one for the through-routing of suburban trains through downtown tunnels, another for the reduction and relocation of passenger and freight terminals, another for straightening of the Chicago River, another for intensive use of railroad property, etc.

DATES AHEAD.

Meeting of Electric Sign Manufacturers to organize an association, La Salle Hotel, Chicago, Ill., December 1.

American Society of Refrigeration Engineers. Annual meeting, New York, N. Y., December 1-2.

American Automobile Association, Richmond, Va., December 1-3.

American Institute of Architects. Forty-seventh annual convention, New Orleans, La., December 2-4.

American Society of Mechanical Engineers. Annual meeting, New York, N. Y., December 2-5.

National Rivers and Harbors Congress. Annual Convention, Washington, D. C., December 3-5.

National Gas Engine Association, Toledo, O., December 4-6.

American Institute of Chemical Engineers, New York, N. Y., December 10-13.

American Association for the Advancement of Science. Annual meeting, Atlanta, Ga., December 29-January 2, 1914.

South Dakota Independent Telephone Association, Sioux Falls, S. D., January 14-15, 1914.

Western Association of Electrical Inspectors. Annual meeting, Cincinnati, O., January 27, 1914.

With the Electrical Manufacturers

W. N. Matthews & Brother, 3740 Forest Park Boulevard, St. Louis, Mo., have issued a circular calling attention to the advantages of the Matthews "Baby" boltless guy clamp. This will fit one-fourth and five-sixteenth-inch guy strands and it is said that it can be installed in less than three minutes and will hold more than 6,000 pounds.

Electrical Construction & Machinery Company, Rock Island, Ill., has bought the old Y. M. C. A. Building and is remodeling it into an office and manufacturing building. The building will hereafter be known as the Electrical Building, and, in addition to its housing the Electrical Construction & Machinery Company, it will also be occupied by the Trio Manufacturing Company.

W. J. Jeandron, 171 Fulton Street, New York City, importer of Le Carbone brushes, reports increasing business in the United States for this product. The engineers of lighting and power stations, he states, are pleased with its long-run qualities and absence of commutator troubles. Buyers of brushes interested will receive complete information by addressing Mr. Jeandron at the above address.

Gregory Electric Company, Sixteenth and Lincoln Streets, Chicago, Ill., has issued its November bargain sheet. This covers 54 pages of closely printed matter containing long lists of direct-current and alternating-current generators, motors and other electrical apparatus. Of peculiar interest are special bargains in 220-volt direct-current motors; the special sale on these machines is to continue to January 1, during which time the company allows liberal freight charges on these motors.

Simplex Electric Heating Company, Sidney and Pilgrim Streets, Cambridge, Mass., is sending out to the trade various circulars calling attention to the appropriateness of the Simplex electric heating devices as Christmas gifts. Special combination sets neatly packed in holly boxes are prepared. Catalog No. 18 containing illustrated descriptions of the full line of Simplex domestic heating devices is also being sent out to stimulate activity in connection with the holiday trade.

Koerting & Mathiesen Company, 22 East Twenty-first Street, New York, N. Y., has issued a unique booklet entitled "Why the Excello Excels." This is a 16-page publication containing some very striking illustrations of the Excello lamp and of building fronts illuminated thereby. A historical sketch of the development of flaming-arc lamps is given and pertinent remarks are made comparing the Excello with other flaming arcs, the advantages claimed by the manufacturer of the Excello lamp being carefully pointed out.

H. W. Johns-Manville Company announces that in order to properly take care of the big increase in its volume of business, the Baltimore, Md., branch house of the company has been compelled to seek larger quarters. The new home is a modern six-story building with floors measuring 47 by 187 feet, located at 207-13 East Saratoga Street, which is within two blocks of the Post Office and right in the heart of the business section. It will include an attractive store and up-to-date offices, in addition to large warehouse accommodations. To facilitate the handling of incoming and outgoing shipments there will be a railroad switch running into the building.

Eugene Dietzgen Company, 166 West Monroe Street, Chicago, Ill., has issued a leaflet describing its new electric blue-printing machine. This is a cylindrical type self-contained machine in which an ingenious arrangement is provided for causing the arc lamp to travel downward steadily across the entire surface of the sensitized sheet and an automatic cutout is arranged so that the lamp circuit is opened when the lamp reaches the bottom of its travel. The company also has a leaflet describing what is called the Dietzgen "Economy Box." This is of value in storing and keeping clean blue-print, drawing, tracing and other papers in large drafting rooms.

Flour City Ornamental Iron Works, Minneapolis, Minn., maker of Corinthian lamp standards, has secured the contract from the city of Long Beach, Cal., for 264 Corinthian lamp standards to be used in lighting the principal streets of that city. The Flour City company feels very much pleased over this order, in view of the close proximity of Long Beach to Los Angeles, which was one of the first cities to install the ornamental cluster lighting system and is looked upon as one of the pioneers in ornamental street lighting. The Flour City company states that its lamp-standard business has shown a gradual and satisfying increase. The company is well pleased with its arrangement with the Western Electric Company, which is its sales agent.

B. J. Carney & Company, Grinnell, Iowa, producers of western cedar poles, announce that they have added a sales department to their western office in Spokane, which has heretofore been the producing end. The office has been enlarged, owing to the constantly increasing business, and G. N. Bacon has been transferred from the Regina office to Spokane to handle the sales end. M. P. Flannery, the managing partner, will continue in charge at Spokane. The Carney company has had a satisfactory year, its Canadian business being particularly brisk. The company is beginning more extensive operations than ever on the Puget Sound extension of the Chicago, Milwaukee & St. Paul Railroad in Idaho, and will have large stocks of cedar poles to offer customers for the coming season.

Record of Electrical Patents.

Issued by the United States Patent Office, November 18, 1913.

1,078,609. Traveling Fan. C. Chaney, Glenwood, Ind. An electric fan is adapted for traveling on a horizontal track and has means for maintaining it at a slight inclination to the horizontal whereby the fan propels itself back and forth. (See cut.)

1,078,619. Electric Furnace. E. Greene, Chicago, Ill. An induction furnace.

1,078,620. Printing-Telegraph Receiver. G. S. Hiltz, assignor to Stock Quotation Telegraph Co., New York, N. Y. Includes electromagnetic type-wheel-setting and printing mechanisms.

1,078,622. System of Control. H. D. James, assignor to Westinghouse Electric & Mfg. Co. Has resistance-controlling solenoid switches governed by an auxiliary machine.

1,078,626. Electrically Operated Duplicate Typewriting Machine. D. Kelley, Syracuse, N. Y. The sending and receiving typewriters are simultaneously operated.

1,078,627. Musical Instrument. J. F. Kelly, Pittsfield, Mass. Comprises a magnetizable plate, a ring attached thereto and coinciding with a nodal line, and magnetic means for vibrating the plate.

1,078,629. Mercury-Vapor Rectifier. J. W. Lewis, assignor to Westinghouse Electric & Mfg. Co. The bulb has a thin fragile glass partition for confining the mercury to a small part of the tube during shipment.

1,078,630. Locomotive. M. Mahoney, assignor to Westinghouse Electric & Mfg. Co. The main motor truck and a radial truck are provided with interconnecting radius bars.

1,078,631. Railway Locomotive. M. Mahoney, assignor to Westinghouse Electric & Mfg. Co. Both the main truck and end truck are motor-driven and specially connected.

1,078,633. Insulator. G. E. Mateer, assignor to Westinghouse Electric & Mfg. Co. The high-tension transformer terminal has concentric conductors, an interposed insulating tube and an insulating bushing composed of a sleeve secured to the cover and a series of overhanging insulating skirts mounted on the sleeve above the cover.

1,078,639. Work Table for Electric Welding Machines. R. C. Pierce, assignor to Toledo Electric Welder Co., Cincinnati, O. Is adjustable in several directions.

1,078,641. Mercury-Vapor Apparatus. J. C. Pole, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. A quartz tube with a restricted portion and a valve permanently sealed within the restriction and having a limit of motion away from its seat.

1,078,643. Trolley Wheel. J. S. Randolph, Glencoe, O. Has an adjustable jaw overhanging the wheel.

1,078,647. Anchor Structure for Overhead Lines. T. Varney, assignor to Westinghouse Electric & Mfg. Co. Between the end of the cable and the end of a bracket is a clevis, turnbuckle and strain insulator.

1,078,653. Ship's Telegraph. F. W. Wood, assignor to C. Cory & Son, New York, N. Y. Includes an electrically operated semaphore.

1,078,654. Electrical System of Distribution. J. L. Woodbridge, Philadelphia, Pa. A storage battery and generator are connected to a load circuit, the battery having an electrolytic valve to permit its discharge to the load but to prevent its charging from that circuit.

1,078,656. Laminated Contact-Brush. C. Ambruster, Roslyn, Pa. The laminations have portions that project and are free for deflection, their ends being beveled.

1,078,675. Electrical Welding Apparatus. J. A. Heany, Washington, D. C. Comprises relatively movable arms carrying electrodes, and a transformer having sections of its core associated with the arms whereby energization of the transformer causes the sections to approach each other to effect the welding operation.

1,078,685. Telephone Exchange Trunking System. A. E. Keith, assignor to Automatic Electric Co., Chicago, Ill. An automatic electromagnetic selecting switch for picking out an idle trunk.

1,078,690. Automatic Telephone System. F. Newforth, Jr., assignor to Automatic Electric Co. An automatic connector switch has a side switch and means to prevent final completion of the connection until a predetermined interval after the side switch has reached its final position.

1,078,693. Lock Attachment for Snap Switches. C. D. Platt, Bridgeport, Conn. The spindle can be locked.

1,078,711. System of Electrical Transmission. J. B. Whitehead, Baltimore, Md. Each conductor for a high-potential system is subdivided into several symmetrically arranged strands to increase the critical breakdown and corona voltage. (See cut.)

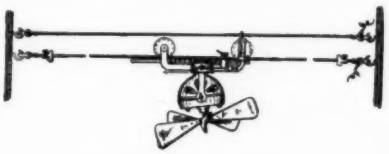
1,078,721. Electrical System of Distribution. G. Crosby, New York, N. Y., assignor to Gould Coupler Co. A storage-battery regulator for train-lighting equipment is governed through a series resistance that is greatly affected by current changes.

1,078,746. Amplifying Case for Microtelephones. W. B. Oliver, Collingswood, N. J. For use by the deaf; the carrying case contains an adjustable shutter for the amplifying chamber.

1,078,751. Electrical Connector and Process of Making Same. O. A. Rogers, assignor to Edison Storage Battery Co., West Orange, N. J. The wire is inserted into a socket and then clamped in place by grooving.

1,078,762. Trolley-Pole Support. J. M. Andersen, assignor to Albert & J. M. Anderson Mfg. Co., Boston, Mass. A spring arrangement for the base of the pole.

1,078,763. Electrical Connection. J. M. Anderson, assignor to Al. & J. M. Anderson Mfg. Co. The socket has a number of contact members nested one within the other and insulated from each other.



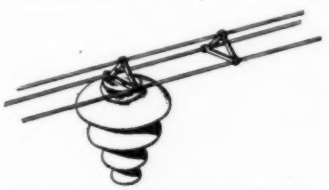
1,078,609.—Traveling Fan.

1,078,766. Spring Terminal Clip. C. Barr, Chicago, Ill. The ends of a metal spring ribbon are bent up to form co-operating members, each with a recess cut out and bent to V-shape to engage the wire.

1,078,772. Call Register. H. P. Clausen and W. T. Curtis, assignors to S. C. Scotten, Chicago, Ill. Has a traveling contact, a series of contacts to co-operate therewith and a manual mechanism for moving the device step by step.

1,078,782. Electrical Gun-Firing Mechanism. I. F. Galindez, Buenos Aires, Argentina. Includes a magneto on the gun, the armature of which is partly rotated and spring-locked by the recoil so as to be ready for active generating rotation on release.

1,078,785. Automatic Rheostat. H. M. Grossman and J. Wynn, Jr., Canton, O. A motor-driven centrifugal blower is pneumatically connected to U-tube so that movement of a liquid therein changes the motor-shunt-field resistance.



1,078,711.—Subdivided Conductor.

1,078,787. Medical Electric-Current Regulator. A. J. Hoenes, Murray, Utah. Electrodes project into an insulating tube in which is a wet sponge acting as a compressible resistance.

1,078,788. Galvanic Cell. M. L. Kaplan, Brooklyn, N. Y. Contains specially prepared manganese peroxide as depolarizer.

1,078,813. Lamp Socket. C. A. Vetter, Pittsburgh, Pa., assignor to Best Electric Co. A lamp-locking socket with spring-actuated pins and shoulders to jam the lamp against removal.

1,078,815. Limit Switch. H. J. Wiegand, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Is actuated by a traveling member at a predetermined point in its path.

1,078,843. Protected-Cable-Terminal Box for Telephone Systems. T. B. Farmer, Baltimore, Md. Includes a carbon ground strip between opposite terminals, an inclosed fuse connecting the pairs through slots in the strip, each inclosure being provided with small air gaps between the tubes and carbon faces.

1,078,859. Mercury-Vapor Apparatus. F. G. Keyes, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. A quartz lamp has a funnel-shaped diaphragm between the cathode chamber and the main part of the tube.

1,078,861. Film-Signal for Moving-Picture Machines. A. F. Koch, Decatur, Ill. An electric signal is actuated when a certain amount of film is unreeled.

1,078,863. Automatic Synchronizer. R. C. Leake, Lakeland, N. Y., assignor of one-half to B. Storer. A switch connecting the machines is electrically closed on attainment of synchronism.

1,078,877. Dynamo-Electric Machine. H. H. Ralston, Norwood, O., assignor to Bullock Electric Mfg. Co. A commutator lead having an opening thereto, a supporting stud in the opening and a spacer on the stud.

1,078,878. Detachable Shade-Holder for Electric Lamps. P. H. Robinson, assignor to Scovill Mfg. Co., Waterbury, Conn. Has a collar divided into segments by slits and a clamping ring encircling the collar and having bosses arranged eccentrically with relation to the beads on the segments to force the latter into engagement with the bead on the socket shell.

1,078,899. Selective Telegraph System. A. Burlingame, assignor to Burlingame Telegraphing Typewriter Co., Boston, Mass. Includes a number of switches arranged in pairs and adapted to be selectively closed by a number of keys.

1,078,913. Arc-Lamp. R. Fleming and C. A. B. Halvorson, Jr., assignors to General Electric Co. Has a special draft tube for creating a draft downward by the lower end of the upper electrode.

1,078,922. Lightning Arrester. J. Oliver Holton, Springfield, Mo. The several arrester members are juxtaposed for high-tension discharge across the intervening air gaps.

1,078,978. Signal Apparatus. C. Williamson, San Francisco, Cal. A street or station indicator for electric cars.

1,078,984. Signaling Mechanism. C. E. Beach, assignor to G. O. Knapp, New York, N. Y. A special arrangement of a signal wheel and circuit-controlling levers.

1,078,985. Signaling System. C. E. Beach, assignor to G. O. Knapp. A fire-alarm system with non-interference alarm-signal boxes connected by two circuits with the central station.

1,079,008. Dynamo-Electric Generator. G. Inrig and L. Inrig, assignors to R. L. Hubler and G. S. Greene, Dayton, O. Includes a centrifugal switch.

1,079,010. Sampler-Operating Device. L. E. Jones, Anaconda, Mont. An electric motor with reversing and timing switches operates a reciprocating carriage.

1,079,013. Electric-Circuit-Controlling Apparatus for Train-Lighting and Similar Systems. E. H. M. Langley and E. W. Price, assignors to Electric

& Ordnance Accessories Co., Birmingham, England. For producing no-light, half-light and full-light effects.

1,079,018. Fuse and Fuse-Carrier. T. E. Murray, New York, N. Y. Has a fuse doubled over the outer edge of a partition.

1,079,028. Electric Lamp Socket. M. Schwartz, Chicago, Ill., assignor of one-half to J. H. Krause. Has a permutation lock associated with the socket key for locking a lamp against removal.

1,079,059. Trolley Collector-Shoe. W. H. Miller, Emaus, Pa. Comprises a shank having a notch in one end and a transverse shoe secured to the other end.

1,079,066. Electric Soldering-Iron. M. H. Rice, assignor to National Electric Utilities Corporation, New York, N. Y. Special means for holding the heating unit in position.

1,079,073. Electric Welding Machine. J. C. Swanson, C. A. Linden, and C. A. Carlson, Jamestown, N. Y. Has a hollow wheel electrode.

1,079,079. Process for the Preparation of Metallic Magnesium. R. W. Wallace and E. Wassmer, London, England. Consists in fusing magnesium chloride, adding gradually magnesium sulphide to the fused salt and electrolyzing the bath.

1,079,088. Flash Light. F. Wysocki, Chicago, Ill. A tubular casing contains dry cells, a switch and a lamp.

1,079,090. Gearing. V. G. Apple, assignor to Apple Electric Co., Dayton, O. For connecting the dynamo and engine shafts.

1,079,116. Electromechanical Warp Stop-Motion for Looms. J. F. Dustin, Fulton, N. Y. Breaking of a warp thread closes the stopping circuit through a detector.

1,079,123. Telegraphone. J. H. J. Haines, New York, N. Y. Electromagnetic means for making a record on two magnetizable media.

1,079,130. Terminal Connector for Concentric-Conductor Cables. F. Kratz and R. Wagner, assignors to firm of Robert Bosch, Stuttgart, Germany. Has conical abutments.

1,079,156. Telephone-Exchange System. W. Aitken, Liverpool, England. Has a call register associated with the subscriber's talking circuit.

1,079,185. Electric Water-Heater. J. Polak, New York, N. Y. The heating elements are so disposed that the fluid flowing from the inlet to the outlet is gradually heated.

1,079,195. Stage Footlighting. C. M. Taylor, Loyal, Wis. Has means for adjusting the lamp carrier in the pit and means for closing the pit when the footlights are in inoperative position.

1,079,213. Electric Regulator for Incubators. C. C. Carter, Chapin, Ill. Thermostatically governed and solenoid-operated door opener and closer.

1,079,225. Electric Heater. W. Dubilier, New York, N. Y. The resistance conductor is bent back and forth in vertical sections with threads of insulation interwoven between the sections.

1,079,229. Electrically Controlled Indicator. W. L. Fitzgerald, Philadelphia, Pa. Electromagnetically operated in either direction.

1,079,233. Electrical Switch. W. J. Gagnon, assignor to Bryant Electric Co., Bridgeport, Conn. A pendent switch having a rotary snap mechanism mounted in the bottom of the cup, and a push-button projecting from the cup.

1,079,235. Attachment Plug. G. W. Goodridge, assignor to Bryant Electric Co. Has an insulating body recessed at its entering end to form a soldering well.

1,079,239. Insulator. J. R. Harris, Crafton, Pa. Around the center pin is a tube with flaring ends to permit slight separation of cap and base for insertion of the wire.

1,079,250. Vapor Electric Device. F. W. Lyle, assignor to General Electric Co. Has means for producing an arc to the cathode from a rod projecting therefrom, and means for preventing the cathode spot from wandering.

1,079,256. Timing Device for Ignition Systems. J. F. Middleton, Pittsfield, Mass. Has a speed-control governor for adjusting the position of the terminal on the shaft.

1,079,259. System of Transmission. H. Nehlsen, assignor to General Electric Co. Includes an induction motor, a direct-current generator driven thereby, a rheostat in the rotor circuit, a rotary converter connected on its alternating-current side in parallel with the rheostat and on its direct-current side in series with the generator.

1,079,269. Manufacture of Magnetite Electrodes. W. Seeger, Nuremberg, Germany. The process consists in heating iron in the presence of steam at a temperature of 1,000 degrees centigrade.

1,079,290.—Indirect-Lighting Pedestal Fixture.

1,079,271. Push-Button Switch. J. H. Smedley, Narberth, Pa. A switch for a lamp adapted to be closed when the lamp is rotated.

1,079,276. Electric Massage Apparatus. J. Thorell, Portland, Ore. Includes a switch worn on the heel of the operator.

1,079,290. Pedestal Indirect-Electric-Lighting Fixture. F. W. Emmer, Hackensack, N. J. In the center of a flower receptacle is a reflector and lamp. (See cut.)

1,079,299. Truck-Reel for Conductor-Wires. T. R. Jenkins, Jr., assignor of one-half each to W. S. Finnell, and Finola Mfg. Co., Hannibal, Mo. For winding the conducting wires of an electric rotary floor-scrubbing machine.

1,079,309. Signal Box. C. E. Beach and H. W. Doughty, assignors to G. O. Knapp, New York, N. Y. For an electric non-interference fire-alarm system.

1,079,312. Pencil-Sharpener. L. B. Chadwick, assignor to General Supplies Co., Boston, Mass. Motor driven.

1,079,315. Portable Reading-Lamp. G. W. Cassidy, East Orange, N. J. Above the reflector for an indirect lamp is an adjustable diffuser.

Patents That Have Expired.

Following is a list of electric patents (issued by the United States Patent Office) that expired November 24, 1913:

571,738. Electric Street or Station Indicator. H. Alwies, St. Louis, Mo.

571,760. Means for Insulating Electric Conductors. T. Guilleaume, Muhlheim-on-the-Rhine, Germany.

571,761. Electric-Light Cord Adjuster. G. L. Gulliford, Bement, Ill.

571,769. Electric Igniting Device for Gas-Burner. G. F. Krieger, Kiel, Germany.

571,780. Dynamo-Electric Machine. W. F. Marzahan, Buffalo, N. Y.

571,791. Switch for Electric Lamps. H. R. Quinby, Rochester, N. Y.

571,792. Electric Arc Lamp. H. R. Quinby.

571,802. Globe Attachment for Electric Lamps. E. Schrantz, St. Louis, Mo.

571,825. Electric Motor Railway-Truck. J. A. Brill and G. M. Brill, Philadelphia, Pa.

571,832. Electrical Railway. R. M. Hunter, Philadelphia, Pa.

571,836. System of Alternating-Current Regulation and Distribution. B. G. Lamme, Pittsburgh, Pa.

571,839. Station Potential Indicator. R. D. Mershon, Pittsburgh, Pa.

571,849. System of Electrical Distribution. O. B. Shallenberger, Rochester, Pa.

571,863. Rotary-Transformer Regulation. R. D. Mershon, Pittsburgh, Pa.

571,888. Electric Rail-Bond. G. H. Scott, Worchester, Mass.

571,906. Apparatus for Multiple Switchboards for Telephone Exchanges. C. E. Scribner, Chicago, Ill.

571,907. Telephone. C. E. Scribner.

571,910. Telephone-Exchange System. C. E. Scribner.

571,927. Electric Switch. J. T. Norton, Boston, Mass.

571,946. Electric Arc Lamp. C. Eschwei, Long Island City, N. Y.

571,948. Telegraph. I. W. Hildburgh, New York, N. Y.

571,950. Fire-Alarm Signal Box. G. F. Milliken, Boston, Mass.

571,951. Means for Generating Electricity From Car-Wheel Axles. M. Moskowitz, Newark, N. J.

571,952. Electric Switch. M. Moskowitz.

571,974. Electric Arc Lamp. G. R. Lean, Cleveland, O.

571,975. Carbon-Holder. G. R. Lean.

571,976. Electric Arc Lamp. G. R. Lean.

572,008. Electric Fan for Ventilating Streets or Alleys. V. V. Hedges, Coffeyville, Kans.

572,013. Underground Electric Power System for Railways. W. L. King, Winston, N. C.

572,036. Wheel with Electrical Motor-Hub for Vehicles. C. Theryc, Marseilles, France.

572,057. Annunciator. F. A. Jennings, Ithaca, N. Y.

572,064. Arc Lamp. J. Rae, New York, N. Y.

Reissue 11,576. Inductor Dynamo. C. P. Steinmetz, Schenectady, N. Y.